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ABSTRACT

This guide is designed to help technical and further education (TAFE) curriculum writers in Australia integrate safety education into vocational education courses. It provides a general overview of occupational health and safety from the perspective of TAFE trade training and a brief summary of the major health and safety issues that might be encountered by members of the Australian work force who have been trained through TAFE. The information presented in this publication is in two sections: a general or core module and several specific workplace topics. The general or core module is intended to stand alone as a unit to be taken by every student at the beginning of the course. The noncore, specific workplace topics are intended to be integrated throughout the course. The noncore topics are accompanied by extensive lists of references to enable the teacher to relate the subject area to a specific trade. Topics covered include chemical hazards, noise, vibration, heat and cold, overuse injuries, manual handling, lighting, radiation, confined spaces, electrical safety, biological agents, machinery hazards, the home, vehicle and road safety, personal protective equipment, and occupational first aid. Appendices include industry-specific hazards, a safety and hazard audit, a glossary, curriculum development worksheets, and lists of 35 organizations and 3 print resources. (KC)

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TAFE

TAFE NATIONAL CENTRE FOR RESEARCH AND DEVELOPMENT

WORKSAFE AUSTRALIA
NATIONAL OCCUPATIONAL HEALTH & SAFETY COMMISSION

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INTEGRATING OCCUPATIONAL HEALTH AND SAFETY INTO TAFE COURSES: CURRICULUM TOPICS

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INTEGRATING OCCUPATIONAL HEALTH AND SAFETY INTO TAFE COURSES: CURRICULUM TOPICS

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ADELAIDE 1990

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FOREWORD BY THE CHAIRMAN, NATIONAL OCCUPATIONAL HEALTH AND SAFETY COMMISSION

The National Occupational Health and Safety Commission is committed to improving the quality of the Australian working environment. Its primary role is to lead national efforts to reduce the incidence of occupational death, trauma and disease.

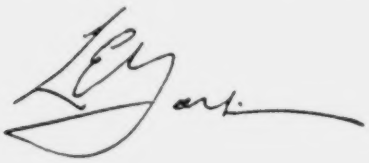
Over 500 people are killed and more than 300,000 are injured in Australia each year as a result of occupational accidents. The National Occupational Health and Safety Commission, through its operational arm, Worksafe Australia, is working with its members, the Australian Council of Trade Unions (ACTU), the Confederation of Australian Industry (CAI) and State/Territory and Commonwealth Authorities, to reduce this tragic loss and suffering and its unnecessary burden on the national economy.

One element of the National Commission's training and education strategy seeks to ensure that all employees, and those preparing to enter the workforce, are provided with appropriate occupational health and safety training.

This project, which is designed to ensure that all students undertaking TAFE vocational courses have access to high quality occupational health and safety training, is a major part of this strategy.

The National Commission acknowledges the co-operative efforts of the ACTU, the CAI and the States and Territories in assisting the TAFE National Centre for Research and Development to achieve nationally agreed occupational health and safety training policies and guidelines for TAFE vocational courses.

I commend the Australian Committee on TAFE Curriculum for initiating this important project and I look forward to steady progress in its implementation.



LOU MARKS
Chairman
National Occupational Health and
Safety Commission

FOREWORD BY THE CHAIRMAN, AUSTRALIAN COMMITTEE ON TAFE CURRICULUM

Occupational health and safety issues have always been important to TAFE Authorities. This concern was reflected in the initiative by the Australian Committee on TAFE Curriculum (previously known as the Curriculum Projects Steering Group) to suggest to the TAFE National Centre for Research and Development that they should seek funds to develop national common core material in occupational health and safety. Those funds were provided by the National Occupational Health and Safety Commission. The Australian Committee on TAFE Curriculum gratefully acknowledges this financial support.

The project outcomes include three publications and national workshops. The publications will help administrators, curriculum developers and teachers. The workshops will help participants to use the national materials to satisfy local needs.

I am pleased to acknowledge the importance of the project, and the usefulness to TAFE Authorities of the outcomes. I am also pleased to have the opportunity of commending staff of the TAFE National Centre for Research and Development for the effective manner in which the project has been conducted.

Trevor Leo.

TREVOR LEO
Chairman
Australian Committee on TAFE Curriculum

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This document has been primarily adapted by Mr. Bob Hall of the Victorian Institute of Occupational Safety and Health, VIOSH, from material produced by VIOSH for the Victorian TAFE Occupational Health and Safety Curriculum Development Project and funded by the Victorian Department of Labour.

The project could not have been done without the generous support, both financial and advisory, from the National Occupational Health and Safety Commission.

Particular thanks are due to the project advisory committee:

Mr. Alan Daniel of the Victorian State Training Board;

Dr. Bill Hall, Executive Director of the TAFE National Centre for Research and Development;

Mr. Graham Hill, Lecturer, Panorama College of TAFE, SA;

Ms. Katherine Lea and Ms. Kathryn Walton of the Confederation of Australian Industry, National Employers Industrial Council;

Ms. Pauline Mageean, TAFE National Centre for Research and Development;

Mr. Dave Mannes of the National Occupational Health and Safety Commission;

Mr. Roger Mathers of the SA Department of Employment and TAFE and the representative of the Australian Committee on TAFE Curriculum;

Mr. Ken McLean of the Australian Council of Trade Unions;

Mr. Graham Mill, Chairman of the SA Industrial and Commercial Training Commission.

Special thanks are also due to Ms. Francis Bray and Mr. Peter Murray and the specialist staff of the National Institute of Health and Safety (Worksafe Australia).

INTRODUCTION

This publication is designed for TAFE curriculum writers. It provides a general overview of occupational health and safety from the perspective of TAFE trade training, and a brief summary of the major health and safety issues which might be encountered by members of the Australian workforce who have been trained by TAFE.

The primary aim of the document is to provide sufficient information to enable TAFE curriculum developers and others involved in curriculum development committees, to participate in determining what and where specific occupational health and safety topics should be included in a particular curriculum. However this publication provides only a brief summary of the issues, it is NOT sufficient in itself to form a basis for these decisions. Therefore curriculum development committees should always consult with occupational health and safety experts who know about the particular vocational area. The appropriate departments to contact for advice are listed for each State and Territory in Appendix 5.

This is consistent with the suggested specific policies in Integrating Occupational Health and Safety into TAFE Courses Policy Guidelines which is another of the three publications in the series which have been developed by TAFE National Centre for Research and Development. The work was made possible by a grant and advisory help from the National Occupational Health and Safety Commission.

1. *Integrating occupational health and safety into TAFE courses: policy guidelines (1989)*, Hill, G.L. and Mageean, P., Adelaide: TAFE National Centre for Research and Development.

2. *Integrating occupational health and safety into TAFE courses: curriculum guidelines (1989)*, Hill, G.L. and Mageean, P., Adelaide: TAFE National Centre for Research and Development.

3. *Integrating occupational health and safety into TAFE courses: curriculum topics (1990)*, Hall, R., Victorian Institute of Occupational Safety and Health (VIOSH), Mageean, P., Adelaide: TAFE National Centre for Research and Development.

The information presented in this publication is in two main sections: a general or core module; and several specific workplace topics.

The general or core module is intended as a 'stand alone' unit to be undertaken by every student at the beginning of the course. It is designed to provide a framework to enable students to:

(a) Analyse occupational health and safety issues according to basic principles of prevention and control;

(b) Interpret occupational health and safety legislation, including workers' compensation;

(c) Identify potential workplace hazards which relate to their occupation and understand the strategies involved in a range of preventive and control measures.

The non-core, specific workplace topics are intended to be integrated throughout the course, where appropriate. These topics can be updated as required to accommodate changes in technology or workplace demands etc. It is expected that TAFE institutions will vary the delivery of these topics to suit the needs of their courses and students.

The non-core topics are accompanied by extensive lists of references to enable the teacher to relate the subject area to a specific trade.

The following texts are highly recommended as important sources of additional health and safety information:

Mathews J., Health and Safety at Work., Pluto Press, Sydney, 1985.

Safety - Health and Working Conditions: Training Manual., Joint Industrial Safety Council, Sweden/International Labour Organisation.

Your Body at Work, National Occupational Health and Safety Commission, Sydney.

Parmeggiani, L. (ed), Encyclopedia of Occupational Health and Safety, 3rd Edition, International Labour Office, Geneva, 1983.

THE "PRICE" OF INDUSTRIAL HEALTH AND SAFETY

In Australia over 500 people die and there are over 300,000 cases of work related injury or disease each year. The direct cost to the economy is around $4.8 billion. However, this represents the tip of the iceberg as far as personal pain and suffering, and losses in productivity, equipment and materials are concerned because many accidents go unreported or happen in unregulated areas of the workforce. This indirect cost may be as much as another $4.8 billion per year (Worksafe Australia, 1987-1988).

On a personal level, the death or illness of a worker has a devastating effect on his or her family. As well as pain and other physical effects, illness can lower the self-esteem of the worker and reduce promotional opportunities. Many find that the attitudes of fellow workers change. If it is impossible to work, many people have difficulties in adapting to a changed lifestyle, usually on a much lower income.

For employers, the cost of insurance premiums and the lost time from production are a major and growing proportion of the operating costs. The need to train casual operators to replace sick and injured workers, as well as losses in equipment, materials and productivity may **lead to management costs much greater than that involved in initial health and safety training or prevention.**

The burden to the community includes the cost of health and welfare services, State funded compensation, and increased price to the consumer.

Resources

Further information on accidents and diseases can be obtained from the following sources:

Worksafe Australia, Sydney.
Australian Bureau of Statistics in your capital city.

For some case studies illustrating how injuries occur and how easily they may be prevented, taken from the files of the Victorian Occupational Health and Safety Inspectorate, see "Case studies of occupational injuries and diseases", WEPD-1 1985, Working Environment Policy Division, Department of Employment and Industrial Affairs, Victoria, June 1985.

PRINCIPLES OF PREVENTION AND CONTROL

Anticipation

The first element of the prevention process, which is often overlooked, is anticipation. The question should always be asked "What if...?"

For example, **what if** a release valve on a boiler should vent - does it vent to outside, near where people are working? **What if** - I enter a confined space like a boiler, sump or tunnel - what if there is not enough oxygen? **What if** - I try to move a heavy load from the workbench to the floor without assistance?

Hazard Recognition/Identification

To provide the basis for student activities, the next step is to correctly recognise and identify the hazards. This may sound obvious but for example noise hazards often go unnoticed but may cause hearing loss, stress or other problems. Chemical hazards are often not recognised until too late. Chemicals in particular combinations may be more hazardous than when they are used separately. This is so when incompatible chemicals are stored together or when two or more chemicals enter the body and act synergistically.

The use of audits and checklists, and regular walk-through surveys are valuable aids in anticipating or recognising a problem.

> **HAZARD** - a situation with a potential for harm to life, health or property.

Risk Assessment

The next step is evaluation: can the hazard lead to an accident or is the hazard under control? The answer may be obvious or it may require a health and safety specialist to conduct a monitoring program.

> **RISK** - is the probability that the potential for harm (hazard) may become actual.

Risk Control

The following principles can be applied to most workplace hazards. They are listed here in order of priority. If it is not possible to carry out the first suggestion, move on the second and so on. The last two methods of control, safe working procedures and personal protective equipment, are last resorts.

1.	Elimination or Minimisation	SAFE PLACE
2.	Substitution	
3.	Safety Devices	
4.	Safe Working Procedures	
5.	Personal Protection	SAFE PERSON

Reliance on safe place control(s) should always be given priority over safe person (behavioural) controls.

Monitoring and Evaluation

Finally there should be a mechanism to monitor the effectiveness of the control measures to assess whether policies and procedures are effectively pursued and whether satisfactory standards of safety performance are being achieved. This can include auditing of systems performance, checklists to monitor for hazards and medical monitoring of workers in hazardous, or potentially hazardous areas.

In addition to these principles, the following measures are good occupational health and safety practice.

1. Increase workers' access to information about occupational health and safety. This information should be continuous and placed in the context of changing conditions in regard to new processes, new chemicals etc.

2. Set up health and safety structures with clear objectives and plans for implementation and evaluation.

3. Provide health and safety training and regular follow-up procedures.

4. Keep records of accidents and illness.

5. Negotiate health and safety agreements.

Activities

1. A construction worker falls from a building site and is paralysed from the waist down. Discuss the personal, social and financial cost to the worker, the employer and society.

2. Use the audit/checklist that is provided in Appendix 2 and do a walk-through survey of your TAFE workshop. Use your own "what if" questions to determine where there are potential hazards that the audit may have failed to bring to your attention. In this way the audit can be developed for your individual work situation. You may wish to use Identifying the Hazards of Work., ACTU, 1986 as a resource.

3. A process worker contracts severe dermatitis while working in a chicken processing factory. What preventive and control measures should be taken?

OCCUPATIONAL HEALTH & SAFETY LEGISLATION

What is Occupational Health & Safety Legislation?

There is occupational health and safety legislation (Acts of Parliament) at both State and Commonwealth level. It is enabling legislation, which means that it lays down guidelines which can be updated as necessary. This legislation lays down the minimum standards to be maintained.

As well as the provisions of State and Commonwealth legislation, there is an additional common law liability if safe practices are not maintained.

Much of our occupational health and safety legislation has followed the British model. A major review of British occupational health and safety law was conducted by Lord Robens in the early 1970's, and the Robens Report of 1972 has been highly influential on Australian legislation.

The Robens approach was towards a unified and integrated system of legislation and enforcement; it recommended tripartism; development of statutory general provisions and duties of care; encouragement of employee participation through safety representatives and safety committees and the use of codes of practice in preference to prescriptive regulations.

What are the aims of Occupational Health and Safety Legislation?

* To prevent the occurrence of workplace disease and injury;
* To compensate for work related illness or injury;
* To rehabilitate the victim of injury or disease.

Occupational Health and Safety Law

An act is in place or being developed in most legal jurisdictions in Australia which implements some or all of the measures recommended in the British Robens Report. In most jurisdictions, older-style laws governing factories, mines and work practices remain in force, along with their typically voluminous detailed prescriptive regulations. The new-style acts in force in 1989 are South Australia: Industrial Health and Welfare Act, 1986; Tasmania: Industrial Safety, Health and Welfare Act, 1977; New South Wales: Occupational Health and Safety Act, 1984; Commonwealth: National Occupational Health and Safety Commission Act, 1985; Victoria: Occupational Health and Safety Act, 1985; Western Australia: Health, Safety and Welfare Act, 1985; Queensland: Workplace Health and Safety Bill 1989; ACT: Occupational Health and Safety Act, 1989.

General Duties

These Acts impose duties on employers, employees, self employed, occupiers, manufacturers and suppliers of plant, equipment and substances used in the workplace. These are called general duties and are used to ensure that those with the requisite authority or control over particular aspects of the working environment exercise that authority or control in a manner that is not harmful to the health or safety of any person.

How is Occupational Health and Safety Legislation Administered?

State and Commonwealth occupational health and safety legislation makes provision for the administration and enforcement via a range of government instrumentalities:

- Occupational Health and Safety Commissions
- Departments of Labour/Employment/Industrial Relations
- Health Departments/Commissions

The day to day enforcement is via an inspectorate. Most "new style" legislation encourages inspectors to adopt a preventive approach through regular inspections of workplaces and provision of advice to employers and employees, rather than waiting for an accident or illness to occur.

Improvement Notices

Occupational health and safety inspectors finding a defect in a workplace which requires correction, but which is not an immediate threat to life or limb, may request or order that certain measures be taken. Some new-style legislation (e.g. Victorian Occupational Health and Safety Act, 1985) specifically permits inspectors to issue written notices demanding that certain improvements are undertaken before a certain date, failure to do so being an offence. The Victorian Act also permits workplace health and safety representatives to issue provisional improvement notices, to which employers may respond by undertaking the improvement or by calling in an inspector.

Prohibition Notices

Inspectors in most occupational health and safety instrumentalities are entitled to forbid the performance or continuation of activities which they believe to be dangerous. In present terminology an inspector's order forbidding an activity is often called a prohibition notice.

Employee Participation

There are four areas where employees and their representatives can play an active role in the prevention or mitigation of workplace disease or injury:

1. Occupational Health and Safety Committees

Several of the new generation of health and safety laws make provision for joint management - employee health and safety committees in workplaces. Similar joint committees exist in some workplaces in States where they are not required by law. The Committees act principally as advisory bodies and forums for discussion and are given quite limited powers under the Acts.

Powers of committees in New South Wales include a right to inspect the workplace and to be given access to relevant information in possession of the employer. The functions of committees in Victoria are to be determined by negotiation between worksite occupational health and safety representatives and employers.

2. Occupational Health and Safety Representatives

Several of the new-style Australian occupational health and safety acts provide for health and safety representatives of workers, either appointed by trade unions having members in a workplace, or elected by workers (ACT, South Australia, Tasmania, Victoria). Victorian representatives, for example, are entitled to inspect the workplace; accompany inspectors; require the establishment of a health and safety committee; have access to relevant information in possession of the employer; be consulted about proposed changes to workplace plant or substances; to be given paid time off work to fulfill the duties of a representative; and may issue provisional improvement notices.

3. Tripartite Forum

In this context the term refers to organisations or processes which involve representatives of three groups with a major interest in occupational health and safety - government, employers and organised labour. The Commonwealth and most Australian States have introduced, or are introducing, occupational health and safety legislation incorporating the principle of tripartism. Professionals are represented on some tripartite bodies, and at a national level State and Territory governments are sometimes represented separately from the Commonwealth.

4. Industry and Site Agreements

Agreements between unions and employers in certain industries and at certain sites pre-date or go beyond requirements of current occupational health and safety legislation. Many of these bipartite agreements include some of the features adopted by recent legislation: e.g. health and safety representatives, health and safety committees, and codes of practice. For a review of the Victorian experience, see "Review of occupational health and safety agreements", Working Environment Policy Division, Department of Employment and Industrial Affairs, Melbourne, July 1985.

STATE AND COMMONWEALTH ACTS AND REGULATIONS

The following is a brief summary of the current legislation. For further information consult *Occupational Health and Safety Organisations in Australia* - published by Worksafe Australia and available through AGPS and your local Department of Labour.

The Commonwealth

Currently the occupational health and safety provisions on Commonwealth land are essentially those of the State in which the Commonwealth property is situated. The Occupational Health and Safety (Commonwealth Employment) Bill, 1989 was put before Federal Parliament during 1989.

New South Wales

The principal Act is the New South Wales Occupational Health Act (1983) which has as its main aim the protection of the health, safety and welfare of people at every place of work in New South Wales and covers the self-employed as well as employees and employers. There are many associated pieces of legislation. If there is conflict between the Occupational Health and Safety Act and associated legislation, the provisions of the Act must be followed.

The Act is administered by:

Department of Industrial Relations and Employment,
P.O. Box 847,
DARLINGHURST N.S.W. 2010

Victoria

The principal Act is the Victorian Occupational Health and Safety Act (1985). Its aim is the promotion and maintenance of the highest degree of physical, mental and social wellbeing of workers in all occupations and to reduce work-related accidents and diseases. The Act is enabling which means it provides clear general objectives, obligations and functions covering every workplace.

The Act is administered by:

Department of Labour,
Nauru House,
80 Collins Street,
MELBOURNE VIC 3000

South Australia

The principal Act is the Occupational Health, Safety and Welfare Act (1986). This Act applies to all South Australian workplaces, including aircraft, ships or vehicles where an employee works and includes any place where an employee goes to work. Employee is defined to include volunteer workers, apprentices and people receiving on-the-job training. It also covers visitors and the general public.

The Act is administered by:

Department of Labour,
SGIC Building,
Victoria Square,
ADELAIDE S.A. 5000

Western Australia

The principal Act is the West Australian Health, Safety and Welfare Act (1985) which aims to:

- promote and secure the health, safety and welfare of people at work;
- protect people at work against hazards;
- assist in securing hygienic work environments;
- foster co-operation and consultation between employers and employees on occupational health and safety issues;
- reduce, eliminate and control hazards at the workplace;
- provide for the formulation of policies relating to occupational health and safety;
- promote education and community awareness of occupational health and safety.

The Act is administered by:

The Department of Occupational Health, Safety & Welfare,
600 Murray Street,
WEST PERTH W.A. 6005

Queensland

The principal Act is the Workplace Health and Safety Bill, (1989) which is designed to secure the health and safety of people performing work and to protect members of the public from danger from work and plant. However, the Act does not cover mine sites, oil wells, rural industries or motor vehicles. There is no tripartite structure as there is in the other States/Territories.

The Bill is administered by:

Department of Industrial Affairs,
GPO Box 69,
BRISBANE QLD 4001

Tasmania

The principal Act is the Industry, Safety, Health and Welfare Act (1977). Tasmanian State regulations facilitate the appointment of safety representatives and committees. The Department of Labour and Industry assists in their training and in establishing their functions and guidelines. In Tasmania safety representatives do not have the right to serve improvement or prohibition notices, nor to direct the cessation of work posing an immediate threat to health and safety as in some other States.

This Act is administered by:

The Department of Labour and Industry,
Brisbane Street,
HOBART TAS 7000

Northern Territory

The principal Act is the Work Health Act (1978) which covers both workers' compensation, rehabilitation and the prevention of industrial injury and disease.

The Act is administered by:

The Work Health Authority,
GPO Box 2010,
DARWIN NT 5790

Australian Capital Territory (ACT)

The Occupational Health and Safety Act, (1989) is a piece of enabling legislation that applies to the private sector.

It provides for the establishment of a tripartite Occupational Health and Safety Council to advise on occupational health and safety matters. The Act codifies a general duty of care. It also provides for administration arrangements associated with designated work groups and elected Health and Safety Representatives and makes provision for enforcement.

The occupational health and safety legislation is administered by:

ACT Government,
GPO Box 158,
CANBERRA ACT 2601

CODES OF PRACTICE

Codes of Practice are detailed examples of how an acceptable level of occupational health and safety can be achieved. They are designed to provide practical guidance to employers and employees on how to comply with a regulation or how to achieve an acceptable level of health and safety on a subject not covered by regulation. Some codes relate to a specific problem (e.g. manual handling) or a process, while others relate to an industry.

If the code is "approved" and referred to in a regulation the employer is obliged to comply with the code as it has the same legal force as the regulation. If the code is not referred to in a regulation the employer has the choice of complying with the code or finding another way of achieving an equal or better level of safety. This gives the employer the flexibility to use a new technique, for example, that may not have been known when the code was written.

An Approved Code of Practice is one that has been declared as approved under Commonwealth, State or Territory legislation. Once declared, it can be incorporated in the legislation in either of two ways:

- It may be referred to or "called up" in regulation; or
- It may be declared as an Approved Code of Practice by itself - without a regulation.

An Approved Code of Practice may be any document or it may be developed by the State Health and Safety Commission.

In some States the Code may be used as evidence to support a prosecution under the relevant occupational health and safety act. If the code is not "approved", it is an advisory document only with no legal force.

THE NATIONAL OCCUPATIONAL HEALTH AND SAFETY COMMISSION

The National Occupational Health and Safety Commission is a tripartite body established by the Commonwealth Government to develop, facilitate and implement a national occupational health and safety strategy. This strategy includes standards development, the development of hazard specific preventive strategies, research, training, information collection and dissemination, and the development of common approaches to occupational health and safety legislation. Section 8(1) (f) of the National Occupational Health and Safety Commission Act 1985 (Cwlth) specifies a function of the National Occupational Health and Safety Commission is "to declare national standards and codes of practice".

NATIONAL STANDARDS

A national standard declared by the National Commission is a document which prescribes preventive action to avert occupational deaths, injuries and diseases. These are only advisory and not legally binding except where a law adopts it and so makes it compulsory.

NATIONAL CODES OF PRACTICE

National codes of practice are declared by the National Occupational Health and Safety Commission pursuant to Part VI of the National Occupational Health and Safety Commission Act. They are documents prepared for the purpose of advising employers and workers of an acceptable way of achieving declared national standards and are not legally binding unless they are taken up in a law.

Generally, codes of practice relate to declared national standards. National codes of practice can be used in two ways. They may be approved as codes of practice under State, Territory or Commonwealth legislation, in which case compliance with the codes is not mandatory but is an acceptable way of fulfilling obligations imposed by that legislation. Alternatively, national codes of practice may be incorporated in State, Territory or Commonwealth regulations and adherence to the national codes is thus, by force of those regulations, made mandatory.

GUIDANCE NOTES

A guidance note is an advisory technical document which may be issued by the National Occupational Health and Safety Commission and by State Occupational Health and Safety Commissions.

It will usually provide detailed information for use by unions, employers, management, health and safety committee representatives, safety officers, medical practitioners and others requiring guidance.

AUSTRALIAN STANDARDS

The term "Australian Standard" refers to a document produced by Standards Australia. This is an independent organisation. It provides a forum where almost 1,400 Australian groups can participate in preparing Australian Standards. These groups represent industry, government and the community on Standards Boards and technical committees. There are almost 4,000 published Australian Standards many of which provide information on subjects related to health and safety. They range from specifications for products and structures to guides for safe working procedures.

An Australian Standard by itself is an advisory document only with no legal force. However, many Australian Standards are referred to or "called up" in occupational health and safety legislation. When this happens, the Australian Standard becomes a legal requirement with a similar status to an Approved Code of Practice. An Australian Standard can be called up in two ways just like an Approved Code of Practice:

1. It may be referred to in a regulation; or
2. It may be declared as an Approved Code of Practice.

If it is referred to in a regulation, the employer must implement the requirements of the Australian Standard. If it is declared as an Approved Code of Practice, the employer must either implement the requirements of the Australian Standard or find another way of achieving an equal or better level of safety. An Australian Standard may be recognised by the letters "A.S." on the cover followed by a number and a title (e.g. AS 1657 "Fixed Platforms, Walkways, Stairways and Ladders").

Resources

1. Australian Nursing Federation (SA Branch) and the South Australian Employers' Federation Inc., 1989, *Health and Safety Research Project Module One*, Adelaide: Australian Nursing Federation.

2. Brooks, A., 1988, *Guidebook to Occupational Health and Safety Laws*, 3rd Edition, CCH Australia.

3. C.C.H. Australia Ltd., *Australian Industrial Safety Health and Welfare*, Australia: CCH Australia Ltd., Volume 1, 2, and 3.

4. Worksafe Australia, 1988, *Occupational Health and Safety Organisations in Australia*, Canberra, AGPS.

Activities

1. Find out the address and telephone number of the following resource centres for occupational health and safety.

   State/Commonwealth Occupational Health and Safety organisations in your State, e.g. State Department of Labour, Department of Health, Worksafe Australia.

At your workplace:

Members of the Health and Safety Committee.

Health and Safety Representatives.

Health and Safety Officer/Adviser.

Occupational nurse/hygienist.

At your college:

Occupational Health and Safety Officer/Adviser.

First Aid Officer and room.

At Head Office:

Occupational Health and Safety Manager.

Safety Officer/Adviser.

2. Do you have access to your State's health and safety legislation?

THE BODY AT WORK

The human body is very susceptible to damage from occupational agents.

- Our lungs have evolved into a magnificent instrument of gas exchange, bringing blood and air into contact through the sheerest of membranes, allowing oxygen to diffuse in and carbon dioxide to diffuse out. For this very reason they are also peculiarly vulnerable to the effects of many toxic gases and fumes which they were never designed to cope with.

- Our skin has developed as a most effective barrier, combining structural strength with lipid (fat) content to be impermeable to water and natural fluids. In the industrial environment, employees may be exposed to fat soluble solvents like trichlorethane, which when in contact with the skin may penetrate this barrier and be absorbed into the body.

Many occupational illnesses and diseases only become apparent after many years of exposure to industrial substances or processes.

- A worker can be doing data processing work at a keyboard and then suddenly develop tenosynovitis or other overuse strain injuries.

- A chain saw operator can be subjected to jarring levels of vibration and then start to develop a numbing blanching of the finger ends that become extremely painful. (White finger or Raynaud's disease.)

- A worker may be handling a benzene-based solvent, leave the job and then develop leukaemia 15 years later, caused by exposure at work

This delayed onset of symptoms makes it far more difficult to link work with its **health** effects than to link work with **safety** aspects, such as a power press cutting off workers' fingers. The loss of a finger in a machine is sudden and obvious - and the remedy of guarding the machine - is obvious to anyone who wants to look.

The more difficult task of linking work with its' health effects, requiring studies in epidemiology (the study of disease in populations) or toxicology (the science of poisons), is an essential part of a prevention process.

Hazards of work.

Physical hazards include:

- noise and vibration;
- radiation;
- manual handling;
- repetitive and stressful work organisation;
- stresses of temperature and humidity;
- machinery;
- poor lighting;
- abnormal atmospheric pressures;
- electricity.

The chemical environment includes exposure to:

- dusts;
- fumes;
- vapours;
- gases;
- liquids;

which may be:

- flammable;
- explosive;
- toxic;
- irritant;
- corrosive;
- carcinogenic.

There are biological hazards from:

- exposure to disease pathogens (disease causing organisms such as bacteria, fungi, viruses, parasites etc.);
- work with livestock;
- animal products, eg. skins, meat;
- work in hospitals, eg. human pathogens;
- work in medical laboratories;

Occupational hazards can lead to:

- physical trauma (sprains and strains, lacerations, abrasions, amputations);
- skin diseases;
- lung diseases;
- eye diseases;
- occupational poisoning;
- hearing loss;
- heat and cold injuries;
- abnormal atmospheric pressures disease;
- electric shock/electrocution;

- radiation sickness;
- infectious diseases;
- cancer;
- disorders of the muscles, tendons and joints.

Physical trauma.

Injuries associated with kinetic energy from moving parts of machinery, impact from materials, vehicles etc. may result in amputations, crushings and contusions. The major causes of fatalities and temporary injury are from lifting equipment and means of transport including wheeled transport.

Skin diseases.

Examples of skin diseases include, irritant dermatitis, allergic dermatitis, skin cancer.

Skin diseases: Causative agents.

Chemical:	mineral oil grease organic solvents cement some chrome compounds resins and chemicals used in plastics chemicals associated with hairdressing photographic chemicals natural products like meat, wool, tobacco chemicals used in tanning
Physical:	abrasion / friction heat / cold burns radiation (UV light)
Biological:	bacteria viruses fungi parasites

Skin diseases: Occupations at risk

All trades involve some risk of skin disease from chemical, biological and physical agents. In the United Kingdom skin disease is the most common industrial disease grouping, accounting for 50% of all time lost.

Lung diseases.

- can be dust induced such as fibrosis (eg. silicosis, asbestosis) and cancer;
- can be an allergic disease (allergic asthma, hypersensitivity pneumonitis);
- can be the result of acute exposure to metal fumes (zinc, copper, nickel);
- can be the result of an infective agent.

Lung diseases: Causative agents.

Chemical:	plastic / metal fumes organic solvents isocyanates acid gases (sulphur oxides, nitrogen oxides) biologically active dusts, for example silica, coal, mineral sands, some woods, asbestos
Biological:	vegetable dust / moulds eg. cotton byssinosis, wheat moulds ('Farmer's Lung')
Physical:	radiation (from inhaled radioactive dusts) extremes of temperature

Lung diseases: Occupations at risk.

- miners
- brick workers
- foundry and metal trades (steel, aluminium, non-ferrous)
- pottery workers
- wood workers
- plastics industry
- agricultural workers
- vehicle and vehicle service industries

Eye diseases/injury.

Examples are ulceration of the cornea and heat cataract.

Eye diseases: Causative agents.

Chemical:	alkalis acids solvents
Physical:	radiation, for example from welding heat dust, abrasion impact, for example from flying particles stress, for example from lack of lighting

Biological: bacterial (conjunctivitis and inflammation)
cysts
parasites (toxocara from dogs and cats)

Eye diseases and injuries: Occupations at risk.

- all trades involve risk from chemicals
- most trades involve risk from flying particles

Occupational Poisoning.

Most industrial chemicals, in sufficient dose, can cause poisoning. Entry to the body can occur by skin absorption, inhalation and/or ingestion. The degree of poisoning is a function of the toxicity of the substance, and the frequency and duration of exposure.

Acute poisoning by a large single dose produces a rapid onset of symptoms, for example, vomiting, pulmonary oedema (fluid in the lung) etc.

Chronic poisoning occurs when there is repeated low level exposure to a chemical / substance. This may lead to permanent damage of the vital organs (lungs, kidney, liver, central nervous system etc.).

Hearing loss.

This is still a major occupational disease. The most common form of hearing loss is caused by long term exposure to intense sound. Most trades people are exposed at some time to damaging noise.

Vibration injury.

This can be whole body or segmental (hand or arm) damage. 'Dead hand' or 'white finger' disease is a known vibration injury. These diseases have been traditionally associated with pneumatic drill operators but are also known to affect vehicle operators (for example, heavy plant equipment operators, bus and truck drivers, tractor drivers).

Extremes of temperature.

Exposure to high temperatures can result in burns, scalds, heat exhaustion and cramps. Foundry and metal trades are at risk.

Cold injury may be associated with damp and wet conditions - cold store workers, building trades.

Abnormal atmospheric pressure.

With the development of off-shore gas and oil deposits, increased numbers of workers are exposed to high atmospheric pressures from diving operations.

Acute conditions such as, air embolism and decompression sickness are occupational illnesses. A chronic condition, bone necrosis, affects many professional divers.

Electric shock and electrocution

Electricity is invisible but lethal. It is a major source of occupational fatalities. All occupations are at risk because anywhere there is electricity there is a risk of electric shock. However, as water conducts electricity the situation is worse in wet conditions.

Radiation diseases.

Ionising and non-ionising types of radiation are widely used in industry and in medical diagnosis and treatment. Ionising radiation, such as X rays and gamma ray for medical and industrial uses, is strictly controlled, however, exposure to sources such as radioactive dust can occur in industries such as mining. There are a number of National Health and Medical Research Council (NH&MRC) Codes of Practice covering different aspects of the use of ionising radiation. These codes are often incorporated into state health regulations.

Non-ionising radiation covers the spectrum from low frequency 50 Hz power through microwave and radio frequencies to ultra violet light. (Australian Standards AS2243 part 5 and AS2772 - 1985 provide a guidance to exposure limits over much of this range.)

Infectious diseases.

A large number of infections are associated with occupations and include:

- leptospirosis
- brucellosis
- Q fever
- anthrax
- ringworm
- tetanus
- tuberculosis
- hepatitis B
- legionnaires
- acquired immune deficiency syndrome (AIDS)

Most at risk are the agricultural and meat work trades. Others at risk include health care workers, particularly from Hepatitis.

Venomous Creatures.

Some trades, for example, agricultural and construction workers are at risk from poisonous snakes, spiders and insects.

Cancer.

Occupational cancer is viewed with increasing concern in the spectrum of work related diseases. It is a serious and often fatal disease, occurring after long latent periods, and the disease progress is usually irreversible. In Australia, those exposed to carcinogens at work are mainly workers in the manufacturing, mining and agricultural industries.

Occupational Cancer: Causative agents.

- skin cancer/caused by soot, tar, mineral oil, radiation/sunlight
- lung cancer/caused by exposure to nickel, asbestos
- bladder cancer/caused by aromatic amines
- mesothelioma/caused by asbestos
- adenocarcinoma of the nose/caused by wood dust
- angiosarcoma of the liver/caused by vinyl chloride monomer

Muscles, tendons and joints injury.

Most trades are at risk from damage to muscles, joints, etc. Disorders can range from acute or traumatic injury e.g. sprains and strains to degenerative and slow onset disorders e.g. overuse injury.

Activities

List the major hazards of your occupation. With the teachers assistance, draw up a table and show how the hazard affects the body, its "route of entry" if a chemical hazard, and an example of a control method.

Resources

1. Mathews, John, 1986, *Health and Safety at Work* (a general reference with sections on noise, chemicals, radiation, occupational hygiene, the human body, etc. plus bibliographies), Pluto Press.

2. Joint Industrial Safety Council, *Safety - Health and Working Conditions - Training Manual*, Joint Industrial Safety Council, Post Box 3208, Stockholm, Sweden.

3. National Occupational Health and Safety Commission, *Your Body at Work*, NOHSC, Sydney.

4. Standards Association of Australia, 1986, *Health and Safety at Work - Principles and Practices, AS1470-1986*, SAA, Australia.

5. Standards Association of Australia, 1983, *Safety and Health in Workrooms of Educational Establishments, AS1485-1983*, SAA, Australia.

6. Department of Employment and Industrial Relations, 1982, *Safety and Health at Work*, AGPS, Canberra.

7. Australian Council of Trade Unions, 1986, *Identifying the Hazards of Work*, ACTU, Australia.

8. Department of Health, N.Z. and Department of Labour, N.Z., 1984, *Diseases Arising from Occupations*, General Occupational Health and Safety, Occupational Health Series No. 3, 1984, New Zealand.

9. Australian Medical Association, 1986, *Occupational Health and Safety*, Australian Medical Association/NOHSC, Australia.

WORKERS AT RISK - SPECIAL RISK GROUPS

Some groups in the work force are more at risk than others. These include young workers.

There are several ways of looking at risk in the workforce. You can identify the main risks according to gender, age, occupation, type of accident or injury, cause of accident and so on. However, the statistics about occupational accidents and disease are clouded by a number of factors including:

* unreported accidents and disease (both legal and illegal unreporting);
* accidents and disease in unregulated areas of the workforce;
* disease which is difficult to link conclusively to the workplace;
* lack of knowledge about health and safety issues and the rights of workers.

Why are young workers at risk?

A safe and healthy workplace is one where the tools, equipment, furniture, processes and products are suitable for all workers. There are, however, reasons why young workers are at particular risk. Young workers tend to be concentrated in high risk occupations, and often lack experience in the workplace. This can lead to accidents and illness when dangers are not properly understood and information is not made available. Consequently accident rates are higher for young workers and those that occur tend to be more serious.

Prevention and Control

* Access to health and safety training on the job
* Information about workplace hazards before work is started
* Opportunities to participate in health and safety committees
* Consideration of young people's height, weight and physical development in the design of equipment and allocation of tasks
* Supervision of inexperienced young workers
* Emphasis on the importance of fitness and nutrition for general and occupational health and safety.

Activity

1. What information should be made available to a new young worker on the first day at the workplace and the TAFE College?

2. A young worker at your workplace starts fooling around with the fire extinguisher/machine guard/goggles. What should you do? (Remember that some reactions can be counter-productive).

Why are migrant workers at risk?

(i) Some groups of migrants are concentrated in hazardous occupations, mostly unskilled and semi-skilled work, where accidents are more likely to happen. Many come from non-English speaking backgrounds. Some examples of hazardous occupations are:

- process and assembly work
- heavy industry
- clothing industry
- construction industry

Major health hazards in these areas include noise, heat, chemicals, (vapours, fumes, fibre, dust), stress, repetitive work, machinery and manual handling.

(ii) Safety education information is generally provided in English. Translation is often difficult and pictorial presentation is often a better method.

(iii) Migrants may, because of language problems, lack access to safety information, workplace committees and unions. Many migrants are not informed of their rights as workers and are employed under unsafe working conditions. They often do not know how to report injuries or where to go for help.

(iv) Migrant women are in a more vulnerable position. There is a high concentration of migrant women working in areas where minimum standards are difficult to enforce, such as outwork.

Prevention and control

Some ways of overcoming this situation are:

- Employees with low levels of English literacy should be encouraged to attend English classes,
- Health and safety information should be provided in a more "visual" way with translation of such information where possible,

- Increased participation of migrant workers in workplace health and safety structures.

Activity

How would you go about making your workplace safer for people who read and speak little English?

Why are women at risk?

Many women are concentrated in hazardous occupations where the risk of contracting particular illnesses and injuries is high, e.g. overuse injuries and dermatitis in process, assembly and keyboard work.

Many women work in unregulated or under-unionised areas of the workforce, especially outwork. They also tend to lack access to unions and workplace committees.

Prevention and control

Some ways of overcoming this situation are:

- encouragement for women to join OH&S workplace structures
- implementation of Equal Employment Opportunity practices, specifically access to information and training and the opportunity to voice OH&S concerns
- increased publicity about occupational health and safety hazards and their control

ACCIDENTS

About 75% of accidents at work are the result of:

- falls and jumps;
- stepping on, striking or being struck by objects;
- overexertion and strenuous movement.

Accidents are frequently blamed on the victim, but a closer inspection of the circumstances often reveals a complex set of causes, including shortcomings in:

- design and maintenance of equipment and tools;

- job design, including pace of work, provision of work breaks;

- physical environment of the workplace - heat, light, noise, slippery or uneven surfaces.

Prevention and Control

- Access to information, in languages the workers can understand, about the hazards in each workplace;
- first aid instructions;
- analysis and redesign of dangerous jobs and processes;
- redesign of tools and equipment.

In addition, records of accidents should be kept and reports should be made.

Activity

Describe all the details of an accidents you know of. In groups, analyse the causes of the accident and whether and how it could have been prevented.

Resources

Australian Bureau of Statistics, Capital City

Worksafe Australia, Sydney

WORK ORGANISATION AND JOB DESIGN

In this section we will discuss:

- work organisation and job content,
- ways to improve work organisation,
- hours of work,
- time for rest and leisure,
- shift work,
- new patterns in working time.

Poorly organised work can lead to stress and lower productivity. For example:

- oversimplified jobs require little skill and provide few opportunities to learn anything useful. The worker is "underutilised";
- repetitive jobs are monotonous and boring;
- jobs which have no possibilities for co-operation are isolated from other workers;
- jobs which do not allow for learning or growth limit the workers' career possibilities;
- jobs which have no real responsibilities require continuous supervision;
- jobs where performance is measured by repetition of a simple task are frustrating and stressful.

A good job should have:

- variety and a reasonable work cycle;
- some choices to make about the work with knowledge about and responsibility for results;
- enough skill for self-respect and the respect of others;
- arrangements for continuous in-service training;
- a chance of a better job in the future.

POINTS TO REMEMBER

Poor work organisation is bad for the worker and for the enterprise. Workers must have a chance to develop and use skills if they are to contribute fully to production goals. Treating workers like machines ignores their potential and creates a dissatisfied, unproductive work atmosphere.

Ways to improve work organisation

1. Mechanisation - but can lead to machine paced tasks.
2. Change of layout.
3. Job enlargement - combining separate tasks.
4. Ergonomic improvements - designing the job and equipment to fit the person.
5. Buffer stocks - enables the worker to work fast or have a break i.e. self paced work system.
6. Job enrichment - adding responsible tasks e.g. product inspection, maintenance of machines.
7. Group work - job enlargement is increased so that a group can plan and organise work methods, schedules and problem solving and see a task through from beginning to end e.g. vehicle building.

POINTS TO REMEMBER

Good work organisation provides room for individual and group initiative. Suggestions should come from both supervisors and workers. As there are no simple solutions to the problems of work organisation, we must take advantage of these suggestions and the experience of others.

Hours of work

The number of hours spent at work can significantly affect the day to day life of the worker. Some trades achieved a 40 hour week in the 1850's. Approximately 1/4 of Australian workers are on shift work.

However excessively long hours of work can be caused by:

- seasonal concentration of work;
- intermittent work being spread over long work days, as in road transport;
- labour shortages, especially of skilled or specialised workers;

The disadvantages of shift work are of two types:

1. **effects on workers' health**: the disturbance of normal biological rhythms brings about special problems. This can contribute to (together with other external factors) digestive disorders, fatigue, and sleep disturbances. Chronic ill health can result in the form of stomach and intestinal disorders. Lack of sleep can, moreover, lead to various nervous complaints;
2. **effects on family and social life**: shift workers often have difficulty with family activities and maintaining normal contact with their spouse, parents and children. Social relationships can be disturbed. This can include contact with friends, participation in clubs, associations and trade union activities and public entertainment.

Prevention

The following are practical measures to improve shift work conditions. To improve the conditions of shift workers, action in two areas is needed:

Improving shift schedules.

- shorter hours of work (including reduction in weekly hours of work, granting of additional holidays and limiting the proportion of working life spent in shift work): a reduction in worker time helps relieve burdens inherent in shift work;
- arrangements to allow workers to choose their shift work in the case of fixed shifts;
- improvements in the frequency and pattern of shift rotation: rapid rotation with more crews is generally favoured as it reduces the need for adjustment and the frequency of night shifts;
- sufficient rest periods between shifts;
- sufficient rest days, especially weekends;
- changes in shift rotation time, if necessary.

Improving conditions of work and life

- fixing meal breaks and other breaks during a shift;
- providing canteens or other facilities for hot meals and drinks;
- providing transport services;
- ensuring first-aid services and medical supervision;
- providing places to rest and relax during breaks and providing recreational equipment;
- improving access to training and social activities.

Since the difficulties of shift workers are increased with night work, systematic efforts are particularly necessary to reduce the burdens of such workers.

POINTS TO REMEMBER

When the regular "morning-work", lunch, "afternoon-work" pattern is not allowed, the worker is seriously affected. Extra wages cannot compensate for lack of sleep and other adverse effects. Measures are necessary to improve not only shift schedules but also conditions of work in a broad sense.

NON-CORE SUBJECTS

CHEMICAL HAZARDS

What are chemicals?

Chemicals make up our air, water and food. In industry, there are about 30,000 chemicals in common use; these are formulated into over 100,000 chemical products. Many more are introduced each year. It is difficult to list them all. A brief listing of some of the major chemical hazards likely to be encountered in particular trade areas is included in the Industry Specific Hazards, Appendix 1.

Information

If you are unsure about what chemicals are used at your workplace, and the information is not available, then you should seek information from the employer, manufacturer or supplier, whichever is most appropriate. Sometimes trade names make it difficult to identify the chemical.

Labelling

Often, the only information immediately available for a chemical or chemical product is the label. This should draw the attention of people handling or using the chemical to the dangers involved. It should take into account all the significant hazards which are likely to occur during handling, storage and use. In addition, the most severe hazards should be highlighted by the use of warning symbols or signal words.

Material Safety Data Sheets

Information on chemicals and chemical products is also available in the form of a material safety data sheet (MSDS). An MSDS should accompany every hazardous chemical product used in the workplace, though this is often not the case as some chemical suppliers only provide them if you ask for them. However, there may be some already available at the workplace and accessible to all workers. Try and obtain one. It should contain:

- Identification, comprising -
  - identity of product (name, etc.)
  - identity of manufacturer or supplier,
  - use or major uses,
  - physical description/properties,
  - chemical ingredients.
- Health Hazard Information, comprising -
  - health effects (both short and long term),
  - first aid instructions,
  - advice to doctor.

- Precautions for use, comprising -

  - exposure limits,
  - any engineering control requirements,
  - personal protection,
  - flammability information.

- Safe Handling Information, comprising -

  - storage and transport requirements,
  - instructions for dealing with spills and leaks,
  - any fire/explosion hazards,
  - any other information of relevance.

- A contact point

- The date of the MSDS.

Where chemicals are in use there should also be access to information about them. It is no use having MSDS information locked away in the Safety Officer's office when there is a spill in the stores. Therefore, ensure that a set of MSDS or at least the emergency clean up and first aid procedures are close at hand.

The National Occupational Health and Safety Commission has published a guidance note for the MSDS content and format (available from GPO Box 58, Sydney, Ph: 02 265 7555). This has been reproduced at the end of this section on Chemical Hazards.

Signs or placards should be located where major or unusual hazards exist at a workplace, such as a flammable chemicals store or a dangerous goods facility, and should outline the precautions that people should take before entering the area (such as special clothing or respirators). Such signs will also provide workers and emergency services with information on hazards.

Routes of Entry

Chemicals are taken into the body by one or more of three general routes:

via the lung by inhalation
via the gut by ingestion
via the skin by absorption.

The eye may also be a route of entry.

There are two main sorts of chemical hazards:

- those that relate to the harm which can arise from the physical properties of a chemical, such as explosiveness and flammability; and

- those that relate to the toxic properties of a chemical.

These can be further subdivided into the following categories:

- Poisonous or toxic chemicals which can be absorbed through the skin, gut or lungs, with effects that vary from rapid unconsciousness to long-term disease.

- Corrosive chemicals which can burn the skin, eyes, lungs or digestive tract, e.g. sulphuric acid, ammonia.

- Irritants which can irritate the skin, eyes or lungs, causing dermatitis or bronchitis, e.g. cement dust, epoxy resins.

- Sensitisers which can cause allergic reactions such as asthma and dermatitis, e.g. isocyanates.

- Explosive or flammable chemicals which can pose the danger of fire, heat and toxic fumes that result from fire and explosions.

Combinations of chemicals can interact. This interaction can be additive, in that the effect is approximately equal to the individual effects of chemicals added together, or it can be subtractive, where the effect of one chemical is reduced by another. However, the most dangerous interaction of combinations of chemicals is called synergistic, where the interaction causes an effect many more times than can be predicted by the individual effects. An example of a synergistic effect is the effects of alcohol on some drugs. In some cases, a strong synergistic effect can be observed where the effect of the individual drug is so small it is not noticeable.

Workplace chemicals enter the body predominantly through the lungs and skin as:

dust
fumes and smoke
vapours and gases
liquids
aerosols and mists

Chemicals can also enter the body by swallowing them.

It is important to note the following:

- the smaller the dust particles are, the further into the lungs they penetrate. The most damaging dust to the lung is too small to be seen with the naked eye.
- metal fumes e.g. from welding can be very damaging to the lungs and can enter the bloodstream.
- some gases and vapours have a sharp or irritating smell, others do not. Chlorine and sulphur dioxide are examples of irritant gases. Never use smell as a means of identifying a chemical.

- some gases e.g. nitrogen (N_2), carbon monoxide (CO), acetylene can asphyxiate by replacing oxygen (O_2) in the air.
- some solvents can rapidly enter the body through the lungs and the skin e.g. during a degreasing operation. This can lead to narcosis (drowsiness and eventually unconsciousness) making you more liable to have an accident. Long term exposure may cause skin, nerve, liver, kidney and other organ damage.

What control measures are there regarding chemical hazards?

A prime objective of any strategy to control chemical hazards is to control exposure to levels at which the risk of adverse effects to health is acceptably low. There are a number of measures which can be employed, which form components of a hierarchy of control measures.

Elimination of hazardous chemicals

Substitution of hazardous chemicals

Enclosure of chemicals at source

Adequate ventilation and fume extraction

Controls which largely depend on human behaviour, such as standard operating procedures, work practices, information, training and personal protection.

Summary of control measures.

1. Whenever possible, toxic chemicals should be eliminated or less toxic chemicals used.

2. Wherever possible the source of emission of dusts, gases or vapours should be completely enclosed.

3. Effective local exhaust ventilation should be provided to extract gases, vapours, dusts or fumes.

4. Small, portable ventilation units should be used for moving jobs such as welding.

5. Where enclosure is not possible work processes and work practices should minimise the emission of gases, vapours, dusts or fumes.

6. Training should include safe handling, use, storage and transportation of chemicals.

7. Limit exposure duration by changing work patterns and schedules.

8. Restrict access to chemicals and areas where chemicals are stored.

9. Work positions should be chosen so that exposure to gases, vapours, dusts or fumes is minimal.

10. Ensure that personal protective equipment (PPE) is available and suitable for the work being done (see section on PPE).

Monitoring

There should be regular monitoring of the workplace to ensure ventilation systems are effective, chemicals are stored correctly and to check for leaks and spills.

Emergency Procedures

For workplaces where there is significant chemical use, it may be necessary to develop procedures for dealing with emergencies such as spills, leaks, fires or explosions. All workers should be aware of the relevant procedures at their workplaces.

It is very important to have:

- emergency showers;
- eye wash stations;
- emergency fire blankets; and
- adequate fire fighting equipment,

where corrosive and flammable chemicals are used. Most dangerous chemicals have a Hazchem code. While information presented by the code is aimed at the emergency services, workers awareness of the provisions of Hazchem will add to safety at work. (The Hazchem code is included at the end of this section).

Exposure Standards.

For most toxic substances, there is a close relationship between the amount of the substance absorbed by the body and its effects on health. By knowing this exposure-response relationship, it is possible to evaluate the risk of exposure. This is called an **exposure limit** and can be used to establish an **exposure standard**. Below the exposure standard, there should be no health hazard for nearly all workers and no deterioration in the degree of comfort that is required to maintain production and to keep the risk of accidents to a minimum. NOTE - Some chemicals, for example, carcinogens and sensitisers are generally considered not to have a definable threshold below which no disease may be caused.

The limit may, however, be expressed by different definitions. The legal status of exposure limits or standards varies from country to country. Though the limit values are health based, they normally reflect a compromise between different interests. Some countries

establish the values as legal standards. The International Labour Organisation (ILO) lists nearly 1200 substances for which occupational limits have been established in a score of countries.

The draft exposure standards published by Worksafe Australia represent airborne concentration of chemicals (or levels of physical agents), the risk of which to workers, based upon an assessment of current technical data, and evidence of known adverse effects, has been considered by a tripartite process as acceptable in normal circumstances. The exposure standards serve as a guide and have no legal status unless they are specifically incorporated into Commonwealth, State or Territory legislation.

The exposure standards detailed in the Worksafe document represent airborne concentrations of individual chemical substances which, according to current knowledge, should neither impair the health of, nor cause undue discomfort to nearly all workers. Additionally, the exposure standards are believed to guard against narcosis or irritation which could precipitate industrial accidents.

Except where modified by consideration of excursion limits, exposure standards apply to long-term exposure to a substance over an eight-hour day for a normal working week, over an entire working life.

The exposure standards do not represent "no-effect" levels which guarantee protection to every worker. Given the nature of biological variation and the range of individual susceptibility, it is likely that a very small proportion of workers who are exposed to concentrations around or below the exposure standard may suffer mild and transitory discomfort. An even smaller number may exhibit symptoms of illness.

It follows that the exposure standards do not provide guidance to the drawing of fine dividing lines between satisfactory and unsatisfactory working conditions, but rather that they are best used to assess the quality of the working environment and indicate where appropriate control measures are required.

POINTS TO REMEMBER

In practice nearly every occupation or industry has some kind of chemical risk to health. Exposure to several kinds of risks is quite common. Sometimes different substances combine or reinforce one another.

The lower the exposure standard of a substance, the more dangerous it is usually considered to be. However, the relationship between various exposure standards should not be used as a general measure of their relative toxicity. This is because, among other things, the values for different substances are often established with a regard to different biological effects such as eye irritation or systemic toxicity. Similarly, the exposure standards should not be used as a basis for the evaluation of community air quality, or for long-term, non-occupational exposures. The exposure standard values of some substances have been lowered based on new research results showing disorders and even cancer.

Workplace monitoring is carried out by measuring the concentration of a certain substance in the air and determining whether it exceeds the standard. Certain substances cause irritation which result in coughing, running eyes or difficulty in breathing; others cause a general feeling of sickness. Many do not give such warning signals, and can therefore cause fatal injuries and diseases without anybody being aware of it. Measures to ensure that the standards are not exceeded is the only way of preventing injury and illness; workplace monitoring will assist in establishing whether or not recommended exposure standards are being exceeded.

When assessing the risk to health of a substance we should also remember that heavy work requires considerably more oxygen, i.e. air, than light work. This means that one potentially breathes in considerably more of the substance involved in heavy work than in light work.

Activity:

1. Find out the names of the chemicals you use in class and at work. Do they have labels? Are MSDS available for them at your workplace? Try and obtain MSDS for the chemicals that do not have them.

   A set of MSDS's are provided for a classroom exercise.

   What are the ingredients of these chemicals?
   What are the main hazards of these chemicals? (Establish relative hazards).
   What are the main health hazards of these chemicals?
   What are the precautions in using these chemicals?
   How should a chemical be stored?
   What should you do in the case of a spill?

   What is the first aid treatment if the chemical is

   splashed in the eye
   swallowed
   inhaled?

2. Find out if your college or workplace carry Hazchem placards. (If not have a look around an industrial area or on a truck for some). Use the Hazchem code to interpret the emergency procedures required if there was a leak or spill of the chemical/s involved.

3. Find out if your college or workplace have written procedures for dealing with emergencies.

Sample Form

Company
Address
Telephone Number
Emergency Telephone Number

Page x of Total y
Date of Issue

Material Safety Data Sheet

IDENTIFICATION

Product Name
Other Names

Manufacturer's Product Code
Use

U.N. Number
Hazchem Code
Dangerous Goods Class & Sub Risk
Poisons Schedule

Physical Description/Properties
Appearance
Boiling Point/Melting Point [°C]
Vapour Pressure [pascals or mm of Hg at 25°C]
Specific Gravity
Other Properties

Flash Point [°C]
Flammability limits [%]
Solubility in Water [g/L]

Ingredients

Chemical entity	CAS No.	Proportion

HEALTH HAZARD INFORMATION

HEALTH EFFECTS

Acute — Swallowed
Eye
Skin
Inhaled

Chronic

FIRST AID — Swallowed
Eye
Skin
Inhaled

ADVICE TO DOCTOR

PRECAUTIONS FOR USE

Exposure Standards

Engineering Controls

Personal Protection

Flammability

SAFE HANDLING INFORMATION

Storage and Transport

Spills and Disposal

Fire/Explosion Hazard

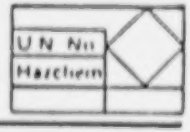
Other Information

Contact Point

HAZCHEM CODE

This Code is taken from the "HAZCHEM" system developed by the United Kingdom Fire Service. The Code characters (numerals and letters) are intended to inform emergency services of the immediate response action to minimise the hazards to personnel and the effects of spoilage.

HAZCHEM SCALE



FOR FIRE OR SPILLAGE

1	JETS
2	FOG
3	FOAM
4	DRY AGENT

P	V	FULL	DILUTE
R			
S	V	BA	
S		BA for FIRE only	
T		BA	
T		BA for FIRE only	
W	V	FULL	CONTAIN
X			
Y	V	BA	
Y		BA for FIRE only	
Z		BA	
Z		BA for FIRE only	

E	CONSIDER EVACUATION

Notes for Guidance

FOG

In the absense of fog equipment a fine spray may be used.

DRY AGENT

Water must not be allowed to come into contact with the substance at risk.

V

Can be violently or even explosively reactive.

FULL

Full body protective clothing with BA.

BA.

Breathing apparatus plus protective gloves.

DILUTE

May be washed to drain with large quantities of water.

CONTAIN

Prevent, by any means available, spillage from entering drains or water course.

Taken from "Safety Guide", VRTA Industry Training Committee.

INTERPRETATION OF THE CODE.

The Numeral. The number indicates the equipment or media suitable for firefighting and, where appropriate, for dispersing spillage, as follows

1 - Water Jets

2 - Water Fog (if unavailable fine water spray may be used)

3 - Foam

4 - Dry Agent (for substances where contact with water is hazardous), e g carbon dioxide, dry chemical or halogenated hydrocarbons

NOTE In addition, firefighting media indicated by a higher number may also be safely used but not those with a lower number e g if the numeral in the code is 2, water fog, foam or dry agent may be used for firefighting but not water jets

The First Letter.

Letter	Risk of violent reaction or explosion	Protective clothing and breathing apparatus	Appropriate measures
P	Yes	Full protective clothing	Dilute
R	No	Full protective clothing	Dilute
S	Yes	Breathing apparatus	Dilute
S	Yes	Breathing apparatus for fire only	Dilute
T	No	Breathing apparatus	Dilute
T	No	Breathing apparatus for fire only	Dilute
W	Yes	Full protective clothing	Contain
X	No	Full protective clothing	Contain
Y	Yes	Breathing apparatus	Contain
Y	Yes	Breathing apparatus for fire only	Contain
Z	No	Breathing apparatus	Contain
Z	No	Breathing apparatus for fire only	Contain

NOTES

1 Full protective clothing is a minimum of breathing apparatus, protective gloves, rubber boots and a chemical splash suit. In the case of some chemicals, a fully sealed gas suit will be required

2 Where breathing apparatus is indicated, chemically impervious gloves should be worn

3 'Dilute' indicates that the substance may be washed away with large quantities of water

4 'Contain' indicates the need to prevent any spillage from entering drains or water courses

The Second Letter. The letter 'E' is added when evacuation of people from the neighbourhood of an incident should be considered by the emergency service. Actual evacuation is a matter for decision after taking into account all relevent factors.

Examples. The code'2W' indicates that personnel should wear full protective clothing and the substance may present a risk of violent reaction or explosion it should not be washed into the drains and the extinguishing medium should be water fog.

The code '3YE' indicates that firefighters should wear breathing apparatus and the substance may present a risk of violent reaction or explosion. It should not be washed into the drains and the extinguishing medium should be foam. There is a risk that may require consideration be given to evacuating the surrounding area. If the letter Y is white on black, then emergency personnel other than firefighters need not wear breathing apparatus.

Resources for Chemical Hazards

1. Australian Council of Trade Unions, 1987, *Chemicals at Work*, ACTU, Melbourne, Australia.

2. ACTU-VTHC Occupational Health and Safety Unit, 1989, *ACTU Health and Safety Policy: Chemical Hazards*, Health and Safety Bulletin No. 62, ACTU, Melbourne, Australia.

3. ACTU-VTHC Occupational Health and Safety Unit, 1986, *Guidelines on Working with Solvents*, ACTU-VTHC Health and Safety Bulletin No. 48, Australia.

4. ACTU-VTHC Occupational Health and Safety Unit, 1982, *ACTU Health and Safety Policy: Guidelines on Chemical Hazards*, Health and Safety Bulletin No. 16, ACTU, Melbourne, Australia.

5. Department of Labour, *Chemicals in Industry - data sheets for inspectors*, Department of Labour, Post Bag, Wellington, New Zealand.

6. National Occupational Health and Safety Commission, 1986, *Guidance Note for the Completion of a Material Safety Data Sheet*, NOHSC, Sydney, Australia.

7. National Occupational Health and Safety Commission, 1988, *Exposure Standards for Atmospheric Contaminants in the Occupational Environment*, NOHSC, Sydney, Australia.

8. National Occupational Health and Safety Commission, 1989, *Draft Guidance Note for the Placarding of Chemical Stores and Draft Guidance Note for Emergency Service Manifests*, NOHSC, Sydney, Australia.

9. National Occupational Health and Safety Commission, 1989, *Draft Guidance Note for the Labelling of Hazardous Substances Used at Work*, NOHSC, Sydney, Australia.

10. National Occupational Health and Safety Commission, 1989, *National Strategy for the Management of Chemicals Used at Work*, NOHSC, Sydney, Australia.

11. Occupational Health and Safety Committee, 1986, *Chemicals at Work*, Printing and Kindred Industries Union, Surrey Hills, N.S.W., Australia.

12. Dumschat, C., Whiting, R., Callaghan, J., *The Material Safety Data Sheet, An Explanation of Common Terms*, Canadian Centre for Occupational Health and Safety, Ontario, Canada.

13. Callaghan, J.M., Dumschat, C.J., Whiting, R.F., 1987, *The Material Safety Data Sheet, A Basic Guide for Users*, Canadian Centre for Occupational Health and Safety, Ontario, Canada.

14. Victorian Road Transport Association Industry Training Committee, undated, *Safety Guide*, VRTA Industry Training Committee, Australia.

Texts which provide in depth information on chemical hazards.

1. Grosselin, Smith, Hodge, *Chemical Toxicology of Commercial Products*, 5th Edition, Williams and Wilkins.

2. Irving Sax, 1989, *Dangerous Properties of Industrial Materials*, 7th Edition, Van Nostrand (available from technical bookshops and major reference libraries).

3. Le Serve, Vose, Wigley, Bennett, 1980, *Chemicals Work and Cancer*, Thomas Nelson. Published in the Workers Education Association series on health and safety.

4. Merck, *Merck Index - an encyclopaedia of chemicals and drugs*, 9th Edition, Merck.

5. ACGIH Documentation of TLV's and BEI's, American Conference of Governmental Industrial Hygienists, 1988.

The National Health and Medical Research Council has issued a number of Occupational Health Guides. See Worksafe Australia publications, Sydney.

There is a lot of information on chemical hazards held on computer files. Services such as TOXLINE and MEDLINE, which abstract papers from the English language medical and scientific literature, are available in Australia through the Worksafe Australia and the National Library and can be accessed through public libraries.

Chemical databases are becoming widely available in Australia on compact disc and it is expected that government and private organisations will increasingly be using information provided in this CD format.

NOISE

Noise is one of the most widespread hazards facing the Australian workforce.

What is noise?

Noise may be defined as any unwanted sound or sound that annoys or disturbs us. We "hear" soundwaves which are picked up by tiny hair cells in the inner ear.

Noise can be measured in terms of frequency and intensity. Humans are able to hear soundwaves between 20 Hz and 20,000 Hz. Very high frequencies (ultrasound) and very low frequencies (infrasound) may also be hazardous to some other parts of the body, even though we do not directly hear them through the ear. Intensity is the energy content of sound.

A special scale is used to make noise measurements - the decibel scale. This is a logarithmic scale which means that an increase of 3dB is double the noise intensity or rate of flow of energy that reaches the ear.

The ear responds differently to different frequencies. The dBA scale is a weighting system for noise measurement which places emphasis on the frequency range to which the ear is most sensitive. This scale best describes damage to the ear caused by industrial noise. A small increase in decibels means a great increase in noise energy. However, this small increase in decibels, will be only just detectable by human hearing. The loudness of a sound is our subjective response. We perceive a 10dB change as being twice (or half) as loud but this is really a ten fold change in sound energy or intensity.

What are the hazards of noise?

- Exposure to high noise levels over a significant period of time may cause temporary and permanent damage to hearing.
- Noise levels may increase stress levels.
- Noise may reduce concentration, which can lead to accidents.
- Noise interferes with communication and warning signals.

How is hearing damaged?

Sudden, very loud noises (gun shots, explosions) can cause acoustic trauma, where the ear drum and possibly the bones in the middle ear (responsible for transmitting sound waves from the ear drum to the inner ear) are damaged.

Prolonged exposure to loud sounds causes damage to the noise sensing hair cells which line a membrane in the cochlea of the inner ear. Loss of hearing caused by noise exposure is normally greatest at those frequencies where the ear is most sensitive, around 4 KHz. If high levels of exposure are continued, the loss of hearing will further increase around 4KHz and spread to lower frequencies. Hearing loss can be short term or long term and depends on the damage the ear has suffered. Tinnitus (ringing in the ear) is a symptom of excessive noise exposure.

How can noise be controlled?

If you suspect that noise is a hazard in your workplace, if you have to shout to be heard, the first step is to have a noise survey conducted (see Mathews *Health and Safety at Work*, pp. 99-103, AS 1269 - 1989 *Hearing Conservation*. SAA, *Noise Control at Work*. ACTU National Occupational Health and Safety Unit, 1987.).

To solve any noise problem in the workplace the following questions need to be asked:

1. Where does the noise come from?
2. How is the noise conveyed to the receiver?
3. What can be done about the noise?

This approach examines the noise problem in terms of three basic elements: i.e. sound arises from a SOURCE, travels over a PATH, and affects a RECEIVER, or listener.

SOURCE → PATH → RECEIVER

Solving a given noise problem might require alteration or modification of any or all of three basic elements:

1. Modifying the source to reduce its noise output.

2. Altering or controlling the transmission path and the environment to reduce the noise level reaching the listener.

3. Providing the receiver with personal protective equipment (but only if the noise source or path cannot be controlled).

Source

In assessing a noise problem it is important to consider carefully the source of the noise and the path the noise takes from source to hearer. One machine can sometimes incorporate many individual sources of noise. A power-press, for example, generates noise when the metal is formed or pierced. Vibration from these sources can be transmitted throughout the body of the power press and the product blank causing noise to be radiated from the structures. This is usually the predominant source. However presses also radiate clutch and gear

noise, motor noise, material handling noise, and perhaps air-exhaust noise.

Pathways

Noise from individual sources may reach the hearer by different pathways. Using the previous example, most of the impact noise from the metal working will reach the operator or other workers in the vicinity directly through the air. This pathway may be blocked by enclosing noisy machines, using acoustic shields or separating quiet areas by air-tight partitions or by placing the operator in his/her own sound-proofed enclosure. Vibration from the pressing operation will be transferred through the machine frame and to the floor. These vibrations will eventually reach the operator as noise radiated from the floor and walls. This source can be controlled by using anti-vibration mountings under machines.

If two noise sources or paths are contributing equally to the noise heard by the recipient, the elimination of one source or path will result in a 3 dB(A) noise reduction, such a reduction is only just detectable by the human ear.

Receiver

Control of the noise at the receiver's position can be achieved by instituting the use of personal protection. This is not a safe place strategy but is placing the onus of responsibility back on the operator who has the least control to effect change in the workplace. The wearing of hearing protectors by workers is generally not well accepted.

Personal hearing protectors should be used as a last resort or as an interim measure while control of noise exposure by other means is achieved. To attain the noise reduction quoted for the particular protector they must be well fitting. This is more a problem for ear plugs because they are difficult to insert and are nearly always poorly fitted.

People who work in a noise hazard area should be provided with rest room/area where noise levels are non-hazardous.

Activity

A number of workers are complaining about headaches and ringing in the ears from noise at work. The employer has supplied the workers with ear muffs but these are not being used.

Discuss the following possible solutions and advise a strategy to present to management to resolve the problem.

(a) ask for different ear muffs.

(b) ask for the individual fitting of suitable ear muffs and ear plugs.

(c) get regular hearing tests carried out.

(d) get an agreement on the restriction of entry into specified noisy areas to those wearing hearing protection.

(e) get an agreement for specified noisy activities to be carried on at night time or when fewer workers are exposed.

(f) get the noise sources identified and the noise levels measured.

(g) get an agreement on the installation of insulation or enclosures around noisy machines.

(h) get an agreement on the gradual replacement of older noisy plant and equipment with new and quieter plant.

(i) ask the employees why they are not using the personal equipment and what would make it more acceptable.

(j) institute a buying strategy that includes consideration of noise levels from the equipment/machine prior to purchase.

Resources

1. ACTU-VTHC Occupational Health and Safety Unit, 1983, *Guidelines for the Control of Noise at Work*, Health and Safety Bulletin, No. 3, ACTU-VTHC, Melbourne Australia.

2. ACTU National Occupational Health and Safety Unit, 1987, *Noise Control at Work*, Melbourne, Australia.

3. Bruel and Kjaer, *Noise Control, Principles and Practice*, (Australia Pty. Ltd.) Melbourne, Australia.

4. Mathews, J., 1985, *Health and Safety at Work*, Pluto Press, Sydney.

5. National Acoustic Laboratories, 1987, *Attenuation of Hearing Protectors*, 5th Edition, National Acoustic Laboratories, Department of Health, Sydney, Australia.

6. Standards Association of Australia, 1983, *Hearing Protection Devices*, Australian Standards 1270-1983.

7. Standards Association of Australia, 1989, *Hearing Conservation*, Australian Standard 1269-1989.

VIBRATION

What is vibration?

Vibration is the rapid motion to and fro of an object (pneumatic drill, chainsaw, tractor seat, factory floor). The important features of vibration are:

exposure (length of time)

frequency (rate of vibration). The body is affected differently by various frequencies.

amplitude (which is measured in terms of displacement, velocity and acceleration).

What does vibration do to the body?

Whole body vibration (e.g. driving a cab) can cause:

- motion sickness
- giddiness, leading to accidents
- damage to bones or joints
- stomach and digestive problems
- variation in blood pressure, leading to heart problems
- effects on nervous system (e.g. weakness, fatigue, loss of appetite, loss of concentration, which can lead to accidents).

Hand-arm vibration (e.g. chainsaws, pneumatic drills):

- "vibration white finger" (or "dead finger"); transient attacks of blanching of the fingers causing numbness or tingling; in extreme cases gangrene. Episodes can be brought on or exacerbated by cold.

What are the prevention and control measures for vibration?

Many problems can be eliminated with improved design:

- pilot-operated controls
- power steering
- improved suspension systems in the design of tools
- isolated cabs

- remote operated equipment, for example, pneumatic drills on back hoe

Changes in work organisation can be used in the interim in the form of job rotation and rest breaks.

Consultation over new equipment at both design and purchase stage often prevents problems occurring in the first place.

Other ways of controlling vibration hazards include:

- designating danger areas and tools
- regular maintenance of equipment

Where there is a health risk due to vibration, monitoring vibration levels, changes over time and the effects on workers' health should be carried out. TLV's have been established for hand-arm vibration.

Activity

A new piece of equipment is about to be introduced at work. What can you do to ensure that it isn't as bad as the old one from the point of view of vibration?

Resources

1. Australian Council of Trade Unions, *Vibration - Proposed ACTU Policy*, ACTU, Melbourne, Australia.

2. Mathews J., *Health and Safety at Work*, 1985, Chapter 6 - Vibration. Pluto Press, Sydney, 1985.

3. Standards Association of Australia, 1983, *Vibration and shock - guide to the evaluation of human exposure to whole body vibration, AS2670-1983*, Standards Association of Australia.

4. Standards Association of Australia, 1985, *Vibration of shock-hand-transmitted vibration - guidelines for measurement and assessment of human exposure, AS2763-1985*, Standards Association of Australia.

HEAT AND COLD

What is thermal stress and heat discomfort?

Thermal stress and discomfort is caused by too much heat or cold. Thermal discomfort occurs where people feel hot or cold or are uncomfortable. Local discomfort may be caused by draughts, local temperature gradients (hot on one side, cold on the other) or poor air conditioning. Heat stress occurs in more extreme thermal environments and is the disruption of the body's thermal balance due to exposure to heat. This results in strain in the body.

Heat stress can be a major problem in some Australian workplaces, particularly in the summer and north of Australia, and particularly, in the metals, refractories, construction and mining industries.

Causes of heat stress and heat discomfort

The heat stress or discomfort that a person experiences depends on a number of factors including the rate of physical activity, the clothing being worn, the air temperature, radiant temperature (heat from a furnace, smelter, etc.), the humidity and air movement.

The body can be regarded as a water cooled engine in which the muscles and internal organs are the heat source, the blood is the coolant and the skin is the radiator. Body temperature is regulated by the amount of blood flowing to the skin. The more blood flowing to the skin the warmer the skin gets and the more heat that can be lost to the surroundings by convection, sweat evaporation, radiation and conduction.

In many work environments sweating and evaporative cooling is the main way the body prevents over heating. The amount of cooling by sweating depends on the amount of clothing being worn, the humidity, and the amount of air movement. The more clothing worn and the higher the humidity, and the lower the air movement the less easy it is for the body to lose heat by evaporative cooling.

Sweating removes water and salt from the body and if these are not replaced on a regular basis heat stress symptoms may appear.

What are the effects of heat stress?

- reduction of concentration leading to risk of accidents;
- aggravation of other hazards, for example, the effects of some chemicals are increased by heat;
- heat disorders, caused by short term heat exposure, which can take the form of:

- heat cramps, caused by salt imbalance in the muscles;
- heat exhaustion, which causes weakness and fatigue, vomiting, headaches and giddiness. It is caused by dehydration and salt imbalance;
- heat stroke, caused by a breakdown of the body's heat control mechanism. Symptoms include dry hot skin and body core temperature often exceeding 40°C, partial or complete unconsciousness. Immediate cooling and prompt medical attention are required.

Illness caused by long term exposure may include:

* heat rash (prickly heat);

* possible chronic exhaustion; sleep disturbances;

Measuring Heat Stress

The following factors are measured when evaluating the thermal environment:

* air temperature (measured by a shielded dry bulb thermometer);

* humidity (measured by the comparison between a wet bulb and dry bulb thermometer or by a hygrometer);

* air movement (measured by an anemometer);

* radiant temperature of surroundings (measured by a black globe thermometer).

There are a number of me.hods used to integrate these measurements and produce an "index" for thermal comfort. The simplest index which is widely used in Australia is the Wet Bulb Globe Temperature Index (WBGT).

POINTS TO REMEMBER

Our body has the ability to maintain a normal body temperature by losing heat. If you feel weak, dizzy or sick in a hot zone, it could be a valuable warning sign.

What are prevention and control measures for heat?

The risk of heat-related illnesses can be reduced by engineering controls, safe work practices to reduce exposure and training. These include:

- insulation of hot surfaces,
- ventilation and air conditioning,
- reduce humidity,
- isolation of workers from heat source,
- shielding to prevent radiant heat reaching work stations - shields can be reflective or absorbent,
- reduction in levels of activity by job modification (mechanisation) and work rotation,
- protective clothing for protection from radiant heat and use of thermally controlled work suits,
- cool rest areas,
- training and acclimatisation,
- provision of cool drinks, salt and fluid supplements.

POINTS TO REMEMBER

The heat generated inside the body by physical work adds to the heat coming in from the surroundings. Many people working heavy jobs in front of furnaces and similar equipment may experience heat stress. Discomfort and heat stress can be reduced by sensible attention to clothing, ventilation, physical workload, work/rest schedules, cool rest areas and cool drinking water.

Cold Stress

Cold stress may be experienced in a range of work environments including outdoor work, work in cold rooms and cold stores.

As we get cold blood is diverted away from the skin to reduce heat loss. Prolonged shut down of peripheral circulation can result in tissue damage from oxygen deprivation. In extreme conditions frost bite can occur where ice crystals are formed in the tissues and on thawing, tissue damage can lead to gangrene. Prolonged exposure to damp, cold situations can cause chilblains and the more serious condition of immersion (or "trench") foot.

Uncomfortably cold working conditions can lead to reduced work efficiency and reduced mental alertness. This reduced performance of manual and mental tasks can lead to a higher accident rate.

The effects of cold are made worse when exposure is also associated with cardiovascular disease, exhaustion and extremes of age.

Workplace Conditions that Influence Cold Stress

- Air temperature
- Wind speed
- Physical activity
- Clothing

The "wind chill factor" is a useful index of the combined effect of cold air and wind speed.

What are prevention and control measures for cold?

- provision of environmentally controlled work stations e.g. heated cabs.
- provision of suitably selected warm clothing e.g. multiple layer garments are often better than a single thick garment.
- a combination of work pace and clothing that does not cause excessive sweating.
- thermal insulation of tools (handles, bars, etc.).
- tools and machines designed so that they can be operated without having to remove mittens.
- rest periods in a warm environment as required.
- provision of hot drinks and avoidance of alcohol.
- environmental monitoring.
- medical monitoring.

POINTS TO REMEMBER

Cold can have an influence on safety, even if the worker is exposed to cold for only short periods.

Activity

A new worker starts in a heat/cold hazard area. What should management/other workers do to make sure his or her transition is smooth?

Resources

1. Division of Health Education, *Take Care during Heat Waves*, Division of Health Education, Health Commission of New South Wales, Australia.

2. Pathak, B., and Charron, D., 1987, *Cold Stress*, Canadian Centre for Occupational Health and Safety, Canada.

3. Pathak, B., and Pilger, C.W., 1988, *Work in Hot Environments*, Canadian Centre for Occupational Health and Safety, Canada.

4. National Health and Medical Research Council, 1979, *Effects of Heat on Health, Comfort and Performance*, NH&MRC, Australia.

5. Cowley, S., 1989, *The Thermal Environment*, VIOSH, BCAE, Australia.

6. Commonwealth Department of Science and Technology Physical Working Environment Branch, 1981, *Thermal Comfort at Work*, AGPS, Canberra, Australia.

7. New Zealand Department of Labour, 1988, *Workplace Air Quality and Environmental Conditions*, Occupational Health and Safety Department of Labour, New Zealand.

OVERUSE INJURIES

What are overuse injuries?

Overuse injuries is a term for a number of conditions. Overuse injuries are often grouped together under the name RSI (or repetitive strain injuries) because the term is popularly recognised in this country. Injuries like this have existed since tools were first made. They are known by many names. Common ones include writers' cramp, housemaids knee, tennis elbow. Medical names include general ones like overuse injury, rapid movement injury and occupational overuse syndrome. Names for specific forms include peritendonitis, tenosynovitis, epicondylitis, carpal tunnel syndrome and so on. These injuries are often combined.

Put simply, overuse injuries can result if muscles and tendons, which connect muscles to bones, become inflammed when movement is repetitive, forceful, jarring, vibrating, pinching or twisting.

Overuse injuries can make it impossible to carry out tasks at and away from work. Simple activities like doing up buttons or making a bed may be painful or simply not possible. It affects your personal, social and financial life as well as work.

Stress, poor lighting, equipment designs and poor work organisation exacerbate this problem.

Is there an overuse injury epidemic in Australia?

There are many reasons for the recent increase in reported overuse injuries. Some of these are:

- Work is being broken down into smaller, more repetitive tasks. Where once a job involved a variety of tasks, it is now more likely to be the one function, repeated over and again, often rapidly.
- New technology, especially computer technology, has been introduced without understanding of the effects, and often without adequate staff training.
- Greater use of machine pacing and monitoring.
- Poor work organisation and workplace design (stress, job dissatisfaction, poor equipment design and lighting, etc.) contributes to overuse injury.
- More overuse injury is reported because more people know about it.
- Overuse injury has begun to affect a more vocal and organised section of the workforce: typists, computer programmers, retail and banking workers.

Who can get overuse injury?

Anyone can get overuse injuries. Some of the occupations most at risk and the related activities are listed below:

Trades e.g. hammering.

Keyboard e.g. word processing, computing.

Clerical e.g. filing, collating, stapling.

Process e.g. assembly, fitting, dispensing.

Retail e.g. checkout operations.

Banking e.g. data processing.

Cleaning e.g. using on/off switches, rubbing.

Many of these areas of the workforce employ predominantly women and migrant workers. This does not mean such people are more "prone" to overuse injury; merely that their jobs are more likely to cause it. (See topic on Workers at Risk.)

What causes overuse injuries? What prevents it?

Poor job design	Prevention
Lack of rest periods	Adequate programmed rest periods and exercise breaks.
Lack of job rotation	Variety of tasks.
High-speed production or movement	Self-paced work.
Forceful, frequent and repetitive movements	Job rotation.
Bonus and overtime incentives	Guidelines for deferring work, dividing tasks and time management.
Work overload at busy times	Sufficient staff at all times. Training in how to refuse unreasonable workloads.
Lack of training	Adequate pre-service and in-service training, especially for new equipment.
Working with machines rather than people	Job rotation, job redesign.

Poor Equipment Design	
Desks, chairs which encourage strained posture	Adjustable equipment and furniture. Provision of foot, wrist and palm rests and document holders.
Machine monitoring of output	Self-paced work.
Poor Workplace Design	
Contributing factors include:	
Inadequate lighting High noise level Poor temperature control	Provision of a safe workplace as noise, fatigue and physical stress appear to contribute to overuse injury.
VDU screens that reflect light	Relocation of screen, fitting of diffuses to lights, anti-glare mesh on screen, provide access to windows for eye relief.
Increase in Workload	
Beginning a new job or returning from extended leave	Build up workload gradually. Warm-up exercises. Workplace negotiation when workload is increased.

What are the signs and stages of overuse injury?

Symptoms	Duration	Prognosis
STAGE 1		
Dull ache and fatigue occurs while working and stops with rest, overnight and at weekends.	Several weeks while performance of repetitive tasks continues.	Minimal or no reduction in work capacity - condition is completely reversible if detected at this stage.

STAGE 2

Recurrent aching and fatigue occurring shortly after commencing work and continuing after work ceases and when performing repetitive daily tasks such as using scissors.	Up to several weeks after cessation of repetitive work.	Reasonable if treated early - can easily develop into Stage 3 if not treated.

STAGE 3

Persistent aching, fatigue and weakness while at rest, plus pain with non-repetitive movements.	Months to years, even if not at work.	Poor - chronic and persistent condition.

What to do if you notice the signs of overuse injury?

- Respect pain and tiredness. NEVER work beyond the point of pain.
- Report injuries as soon as possible.
- Seek medical advice promptly if pain persists. The time required for an overuse injury to heal depends on the timeliness of intervention and treatment.
- There is an increased risk of contracting overuse injury when working more than five hours per day at a repetitive task.

Activities

Consider some of the processes and operations in your trade which may contribute to overuses injury. In particular, consider the situation for unskilled or semi-skilled workers.

Here are some ways that office work might change, partly because of the problem of overuse injury.

- Keyboard work will be done by many, no longer a specialist skill.
- Work speed will be less important.
- Proofing, editing and clerical duties will be more important.
- Handwriting will be used more often.
- Job categories will be less rigid.

Can you suggest others?

Resources

1. ACTU-VTHC Occupational Health and Safety Unit, 1982, *Health and Safety Bulletin No. 12, Guidelines for working with screen based equipment*, ACTU-VTHC, Australia.

2. ACTU-VTHC Occupational Health and Safety Unit, 1983, *Health and Safety Bulletin No. 26, ACTU health and safety policy: screen based equipment*, ACTU-VTHC, Australia.

3. Department of Employment and Industrial Relations Working Environment Branch, 1983, *Occupational safety and health working environment series 16: Office design at work (2nd Ed.)*, DEIR, Australian Government Publishing Service, Canberra.

4. National Occupational Health and Safety Commission, 1986, *The prevention and management of occupational overuse syndrome: A general code of practice*, NOHSC, Australian Government Publishing Service, Canberra.

5. National Occupational Health and Safety Commission (Worksafe Australia), 1989, *Guidance Note for the Prevention of Occupational Overuse Syndrome in Keyboard Employment*, Australian Government Publishing Service, Canberra.

6. The Swedish Work Environment Fund, *Make the Job Easier: Human proportions*, The Swedish Work Environment Fund, Stockholm, Sweden.

MANUAL HANDLING

What health problems are associated with manual handling?

Manual handling includes lifting, moving, pushing and pulling. Some effects on health are:

- Back injuries. This is the most common industrial injury and is the cause of the greatest loss of work time due to injury.

  Injury can occur to the:

  - back muscles and ligaments,
  - spine (lumbar and sometimes thoracic vertebrae),
  - intervertebral discs.

- Abdominal hernia (damage to the muscles lining the abdominal cavity).

- Aggravation of respiratory and heart disease.

- Fatigue, which can cause accidents.

- Musculoskeletal injuries caused by sudden exertion resulting in strains to the legs, arms, tendons; inflammation of joints and peripheral nerves.

- amputations and lacerations.

Identification and assessment of manual handling risks.

Prevention of manual handling injuries generally requires an identification and assessment of risk factors and the application of appropriate control measures.

There are a number of risk factors that should be considered and include:

- the actions and movements involved
- layout of the workplace/work station
- working posture and position
- duration and frequency of the manual handling activity
- location of loads and distances moved
- weights and forces

- characteristics of loads and equipment
- work organisation
- conditions of the workplace
- skill and experience of employee.
- age of employee
- clothing
- special needs (e.g. returning to work after absence, specific disability)

What preventive or control measures are there?

Control can be accomplished by a combination of:

- **job redesign**, to minimise manual handling and to decrease the frequency and speed of movement,
- **modify the object** e.g. to make it lighter, make it less bulky, provide handles,
- **modify the workplace layout** e.g. provide adjustable work stations, improve storage. Provide tools that are well balanced, suspended, provided with vibration isolation,
- **rearrange materials flow** e.g. rearrange containers, the way materials are moved around the workplace, use hoses and pipes to move liquids instead of carrying,
- **modify movements, use different actions** to reduce bending, reaching, lifting, pushing, pulling and carrying,
- **provide mechanical assistance** e.g. trolleys, self adjusting work platforms, ramps, levers, cranes, hoists, forklifts, to assist the task,
- **provide for team lifting** where mechanical assistance, object modification or job redesign is impractical,
- **provide training** in correct manual handling principles of identification, assessment and control. First aid instruction has been shown to have a spin off in increased health and safety awareness including recognition of manual handling risks.

Activity

Look at your classroom/workplace. How can the job, equipment or furniture be redesigned to reduce the need for manual handling?

Resources

1. Canadian Centre for Occupational Health and Safety, 1988, *Workshop on Workplace Back Injuries*, CCOHS, Canada.

2. Department of Labour, 1988, *Manual Handling - Regulations and code of Practice, 1988*, Department of Labour, Victoria.

3. National Occupational Health and Safety Commission (Worksafe Australia), 1989, *National Strategy for the Prevention of Occupational Back Pain*, Australian Government Publishing Service, Canberra.

4. National Occupational Health and Safety Commission (Worksafe Australia), 1990, *National Standard and Code of Practice for Manual Handling*, Australian Government Publishing Service, Canberra.

5. Standards Association of Australia, *Code of Practice for Manual Handling of Materials, AS1339-1974*, Standards Association of Australia.

6. The Swedish Work Environment Fund, *Make the job easier: Human proportions*, The Swedish Work Environment Fund, Stockholm, Sweden.

LIGHTING

Adequate lighting is important, whether at work or at home. The eye is like a camera and with insufficient or poor quality light we cannot see properly.

What is inadequate lighting?

- light with insufficient intensity for the job task
- extremes of contrast e.g. working in shadows or bright light
- light that has different spectral qualities to natural light
- glare from unshielded globes
- reflection from shiny surfaces

Inadequate light can cause general fatigue, eye strain and headaches.

Lighting requirements will be determined by:

- the nature of the work (more light is required for precision work)
- the eyesight of the workers
- the form, size and light reflecting properties of the workplace and whether the object is easily distinguishable from the background.

Good lighting should:

- provide enough light for the job in hand
- be comfortable to the eyes
- avoid troublesome reflections
- be substantially uniform

Prevention

Reflection can be reduced by using non-reflective surfaces, painting walls with non-reflective paint. Use of light colours in premises maximises the effectiveness of natural or artificial light. Glare can be reduced by careful positioning of lights. Use diffusers with fluorescent tubes and shades with globes. Ensure even light intensity in work areas.

POINTS TO REMEMBER

Lighting problems are a combination of light sources, glare, reflections and shades.
(A simple rule of thumb)
Good lighting requires light coloured walls!

Activity

- What can be done to make the best use of light through the windows, doors or skylight?
- Do you think you require more artificial lighting in addition to daylight?
- How are the lights positioned in relation to the work? Are there any shades that shadow the work?
- Are there any glare problems due to daylight? How about glares due to lamps?
- Do the older workers have an adequate amount of light?

Resources

1. Department of Employment and Industrial Relations Working Environment Branch, 1983, *VDUs at Work Occupational Safety & Health Working Environment Series No. 13*, AGPS, Canberra, Australia.

2. Department of Employment and Industrial Relations Working Environment Branch, 1983, *Daylight at work, Occupational Safety & Health Working Environment Series No. 5*, AGPS Canberra, Australia.

3. Commonwealth Department of Productivity Physical Working Environment Branch, 1979, *Artificial Light at Work, Occupational Safety & Health Working Environment Series No. 6*, AGPS, Canberra, Australia.

RADIATION

What is radiation?

Radiation is part of our world and is produced by all kinds of things: sun, television, broadcasting stations, microwave ovens, VDUs and even some building materials, like bricks and rocks. Some effects of radiation are good, but all forms can be harmful.

Radiation can be divided into ionising and non-ionising radiation. Non-ionising radiation is also known as electro-magnetic radiation. This is the transmission of energy through space or matter in the form of alternating electric and magnetic fields.

Ionising radiation is radiation capable of producing ions i.e. charged particles, in the material they pass through.

Spectrum of radiation.

Non-ionising radiation:
- Power electro-magnetic fields
- Radiowaves
- Microwaves
- Infra-red rays
- Visible light - sunlight
- Ultraviolet rays

Ionising radiation:
- X rays
- Gamma rays
- Alpha particles
- Beta particles
- Neutron particles

Radiation may be encountered in the following industries.

Non-ionising:

- power industry - electric fields around transmissions lines and switching yards;
- general industry - RF heat sealers, IR wood and glue driers, electrical apparatus;

- health industry - diathermy units, UV germicidal lamps;
- metal industry - UV and IR emissions from welding and furnaces, EM from RF furnaces/crucibles;
- telecommunications industry - radio lines, microwave point to point transmitters, radio and TV broadcast aerials;
- printing industry - IR and UV lamps;
- construction industry - laser alignment equipment.

It is important to recognise that natural sunlight, in particular its' ultra-violet component, can cause skin damage and in particular excess exposure can lead to skin cancer.

Ionising:

- agriculture industry - soil moisture and density gauges;
- printing industry - gauges to measure thickness of paper coatings, static eliminators;
- chemical industry - static eliminators, beta gauges in plastic sheeting manufacture;
- industrial radiography - X ray and gamma ray for weld examination and integrity testing;
- food industry - gamma ray sterilisation;
- medical products - gamma ray sterilisation.
- in general industry for materials handling - to indicate a full container, quantity of material on a conveyor belt etc.

Health hazards of radiation.

The health hazards of radiation include:

1. general damage to the body;
2. cancer (linked with exposure to electric fields, to MW/RF radiation, to UV radiation, and to ionising radiation);
3. cataract of the lens of the eye;
4. reproductive damage;
5. birth deformities;
6. blood changes and alteration of immune response;
7. cardiovascular changes;
8. nervous system effects and behavioural changes;
9. skin burn and other forms of thermal damage;
10. other eye damage.

Prevention

Exposure to all forms of radiation should be reduced to the lowest levels technically feasible. For some forms of radiation, in particular ionising radiation, there may be no safe level of exposure. A **preventive strategy** requires:

- radiation survey of the workplace;
- that no process/product emitting radiation be installed in a workplace without addressing the health hazards;
- implementation of engineering controls;
- if necessary, administrative control and protective gear to reduce exposure levels below recommended standards (if such exist);
- regular medical monitoring of all exposed persons;
- provision of information on radiation hazards and adequate training.
- adequate lock out and safe entry procedures during maintenance.
- clearly posted warning signs and labels.
- provision of personal protective equipment.

Activity

Draw up a list of radiation sources in your workplace (these are most likely to be non-ionising sources but ionising sources may be present). Which sources are considered a hazard, what precautions are taken for their safe use and what warning labelling is used?

Resources

1. Standards Association of Australia, *Laboratory Safety - Radiation, Ionising AS2243.4*, Standards Association of Australia.

2. Standards Association of Australia, *Laboratory Safety - Radiation, Non-ionising, AS2243.5*, Standards Association of Australia.

3. Mathews J., 1985, *Health and Safety at Work: A trade union safety representatives handbook (Chapter 8, Electromagnetic Radiation)*, Pluto Press, Sydney, 1985.

4. ACTU-VTHC, 1983, *Health and Safety Bulletin, 'Guidelines on Health Hazards of Electromagnetic Radiation'*, ACTU-VTHC, August, 1983, Australia.

SAFE WORKING IN CONFINED SPACES

What are Confined Spaces?

There is no single definition for a confined space but there are a number of factors to consider which together may constitute a confined space. These are a space of any volume which:

- is not intended as a regular workplace
- has restricted means for entry and exit
- may have inadequate ventilation and/or an atmosphere which is contaminated or oxygen deficient
- is at atmospheric pressure during occupancy, i.e. is not a specifically designed pressure chamber

Confined spaces may be:

- storage tanks, process vessels, boilers, silos, i.e. tank-like compartments which have only a manhole for entry/exit,
- open topped spaces of more than 1.5m in depth such as degreasers, pits, which are not subject to good ventilation,
- pipes, sewers, tunnels, shafts and similar structures,
- shipboard spaces such as cargo tanks, double bottom tanks, ballast tanks, which are entered through a small hatchway or manhole.

Why are confined spaces hazardous?

The major hazards associated with confined spaces and which commonly result in fatalities are:

- Oxygen deficient atmospheres. Oxygen is normally 21% of air. However, a number of situations may reduce this proportion either by displacement by another gas, which itself may be toxic or non toxic, e.g. purging with inert gas nitrogen, or by depletion, e.g. by rusting (oxidation) in tanks and holds.
- Oxygen enriched atmospheres. A number of accidents in confined spaces are attributable to the use of oxygen e.g. for oxy-acetylene welding, or for purging of bad air in confined spaces or where the oxygen has been accidentally allowed to escape to enrich the atmosphere. Clothing, hair and most materials are much more likely to catch fire or explode in oxygen enriched atmospheres.

- Explosive atmospheres. An explosive atmosphere may be a result of residual solvent or fuel in tanks after cleaning or emptying; presence of flammable dust, etc.

- Toxic atmosphere. Degreasing solvents, vapours, gases produced by chemical or biological reactions (sewer and rotten egg gas, engine exhaust gases) have been the agents responsible for many confined space fatalities.

- Physical injury from accidental operation of process equipment or services. Process equipment and services must be isolated from energy sources to prevent accidental start up during repair, maintenance, cleaning, etc.

- Inadequate backup or rescue facilities to handle non routine situations.

Prevention of confined space accidents

The following is a sequence of steps that can be undertaken to avoid accidents:

1. Confined space/work must be **identified and recorded** with a "responsible person" i.e. a person designated by management to authorise entry into confined space(s) and issue permits-to-work (see glossary).

2. **Assessment**

   The first question to ask in assessing a job is "DOES IT HAVE TO BE DONE?" This may appear to be an obvious question but is often not considered.

   i.e. Is the work a management whim?
   How often will the plant be used?
   Do the number of operations justify the work and associated risks?

   The second stage in assessment is to consider the work to be done - every aspect of it, including the methods to be used (is the safest method of cleaning, repair, etc. being used? - and identify all inherent hazards. Hazard identification should not be limited to hazards local to the particular operation. Included in the assessment should be plant and personnel not directly involved who may be affected or exposed to hazards (or present hazards) while the work is in progress.

3. **Withdrawal from Service**

   Before plant is prepared for work it must be withdrawn from service so that there is no chance of production personnel (or any other) activating any equipment.

4. **Isolation**

Withdrawal from service alone is insufficient and plant and equipment should be locked off so that mechanical or electrical power cannot be restored, liquids, fumes, gases, etc. cannot enter the process, etc. until the work is completed.

5. **Cleaning and Purging**

Cleaning and purging may be necessary when working in or on vessels, pipes, etc.

6. **Atmospheric Testing**

This may be necessary if the work involves entry into a confined space or work in a potentially flammable atmosphere etc.

7. **Rescue**

During assessment the potential for rescue to be necessary should be considered. Equipment and **trained** personnel should be available at all times when a hazardous work situation may result in personnel requiring rescue (e.g. in confined spaces).

8. **Certification**

When the responsible person is satisfied that all potential hazards have been identified and the appropriate precautions taken then a certification may be issued for work to proceed.

All requirements for safe execution of the task must be included in a certificate and the success of the permit to work relies upon the supervisor/responsible person ensuring that all necessary measures have in fact been taken, and obtaining signatures from the relevant people.

Time is an essential component of a certificate and the time at which the certificate expires is crucial to ensuring the safety of personnel engaged in the work.

Should an extension to the permit be required the certificate must be returned to the responsible person who will satisfy him/herself before signing that the work may continue with or without further precautions as necessary. Certifications should be filled out in ink using carbon copy pads. One copy should be issued to the person doing the work, who should display it at the site of work. One copy should be retained by the responsible person.

9. **Cancellation**

When the work is complete the certificate is to be returned to the responsible person by the person to whom it was issued. A declaration must then be signed which states that all personnel and equipment are withdrawn from the work site and that personnel involved have been warned that the site is unsafe. Should it be necessary to return to the site (to collect forgotten tools, etc.) then a permit must again be issued by following the above procedures.

10. **Return To Work**

The person in charge of the process should satisfy him/herself that the work has been completed and the permit has been satisfactorily cancelled before allowing the process to resume.

Activity

Find two case studies of confined space accidents (use the literature; health and safety magazines, papers, fatality reports, etc.).

Discuss the similarities and differences in the two cases leading to the accidents.

Can you identify some confined spaces in your workplace?

Obtain a sample "permit-to-work" form for confined space work. Does this form cover all the aspects of safe work for the confined space accidents and for your confined spaces at work?

Resources

1. Cowley, S., 1988, *Entry Into Confined Spaces*, Victorian Institute of Occupational Safety and Health, Ballarat College of Advanced Education, Ballarat, Australia.

2. International Labour Office, *Encyclopaedia of Occupational Health and Safety*, ILO, Geneva.

3. Standards Association of Australia, 1986, *AS2865-1986*, SAA, Australia.

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ELECTRICAL SAFETY

Hazards of Electricity

Hazards arising from electrical installations and equipment are broadly of two kinds:

- direct personal injury - shock and electrocution
- fire and explosion

Faulty and worn out equipment is the major source of electrical accidents. Overhead wires and work in outdoor areas e.g. building sites are also major contributions to electrical accidents.

Injury to Person

Electric Shock is the effect of electric current passing through the body. The severity of the shock depends on the magnitude, duration and frequency of the current, the state of health of the victim and the electrical resistance of the skin and clothing.

Effects range from a slight tingling sensation to skin burns through to death. In severe cases the victim is likely to be unconscious and require artificial respiration. The shock may cause muscular spasms so that the victim is unable to let go and grips very tightly onto the source. The shock may also make the victim jerk and move which can be dangerous in small spaces or at heights. Electric shock may cause internal bleeding and destruction of tissues, nerves and muscles. Burns are common.

Rescue and Assistance to Victims

Electric Shock

All personnel should be familiar with the external heart technique and the mouth-to-mouth method of resuscitation (cardiac-pulmonary resuscitation or CPR). Delay in rescue and resuscitation of an electric shock victim may be fatal. The first minutes are vital. The action which should be taken is as follows:

- BEWARE! The victim and surroundings may still be electrified.
- Immediately switch off the electricity if possible and summon medical aid.
- If the electricity cannot be switched off remember that the victim is electrified until released. The victim must be pulled or pushed away from the conductor, or the conductor removed, using any type of dry insulating material such as wood, rope, clothing, rubber or plastic. Do not use metal or anything moist.

- After rescue check the victim's pulse and breathing. If the pulse is absent, both rescue breathing and heart massage will be required. They can be carried out by one person following a sequence of two breaths followed by 15 chest compressions. Two rescuers can work in unison, one giving heart massage and the other mouth-to-mouth resuscitation.

- In laboratories which have mechanical resuscitators available, do not delay treatment until a resuscitator is located.

Electrical Burns

Electrical burns caused by direct passage of current are often deep seated and slow to heal. Burns from induction heaters can also be slow to heal. Skilled medical attention should always be sought.

Prevention of Electrical Accidents

- Eliminate or reduce hazard at source e.g. low voltage equipment in high risk areas such as building sites, damp areas.

- Engineering controls

  - provide interlock switches on equipment covers,
  - provide earth leakage current breakers on power outlets,
  - ensure all equipment is correctly earthed, "fused" and provided with overload current breakers,
  - provide electricity rated insulated tools,
  - provide wooden ladders (not aluminium ladders, which conduct electricity).

- Administrative/Organisational

  - ensure all equipment is maintained and that there is a clear allocation of responsibility to someone for electrical safety,
  - ensure all electrical equipment is routinely inspected and that there is a system for reporting faults and for having faults rectified.

- Education and Training

  - ensure workers are correctly trained in the use of electrical equipment, precautions to take to avoid personal injury, fire or explosion and what to do in an emergency,
  - ensure electrical workers are first aid trained in cardiac pulmonary resuscitation (CPR).

- Personal Protection

  - use correctly selected insulating gloves, clothing and footwear; non conducting hard hats.

Electrical Fires

The basic rules for electrical fires are:

- Sound the alarm, by operating the fire alarm if installed or by shouting "FIRE", to warn others in the building and to summon aid.

- Make sure the fire brigade has been called.

- If possible switch off all electrical power to the equipment.

- If practicable attack the fire with a carbon dioxide, vaporizing liquid (e.g. BCF) or dry powder extinguisher. Do not use water or foam extinguishers, they are electrical conductors.

- Avoid breathing fume from electrical fires. They can be extremely toxic.

- If the fire is out of control when discovered, or shows signs of getting out of hand, leave the area closing windows and doors to help contain the fire.

- Arrange for discharged or partly discharged extinguishers to be refilled.

Activity

Prepare a checklist for the safe use and working of the following:

- power tools, both in workshop and outdoor situations,
- extension lead,
- mobile crane,
- power generator.

Discuss the advantages and disadvantages of using ELCB's and low voltage equipment on construction sites.

Make a flow chart of what you would do if you found someone who had been electrocuted.

Resources

1. C.S.I.R.O., 1975, *Electrical Safety A Code of Practice*, CSIRO, Melbourne, Australia.

2. Department of Labour and Industry, *Rural Industrial Safety No. 9 - Electrical Safety*, Melbourne, Australia.

3. Department of Employment and Industrial Relations, 1978, *Basic Training Manual No. 1, Safe Procedures Electrical Trades*, AGPS, Canberra, Australia.

BIOLOGICAL AGENTS

There are a large number of infections and diseases associated with occupations.

What are biological hazards?

These are hazards due to agents of biological origin: these may be life forms e.g. bacteria, fungi, parasites, viruses, plants; or their products e.g. toxins. They may be agents from plant and wood products that produce an allergenic effect e.g. asthma, skin rash.

Most occupational diseases due to infections are zoonotic in origin i.e. diseases that are caught directly from infected animals or humans.

What are the effects?

Exposure to biological agents may cause acute and chronic infections, toxic and allergenic reactions.

Some 500 cases of occupational infections requiring more than one week off work are reported annually in Australia, many affecting abattoir workers, animal handlers and health and child care workers.

Transmission occurs in a variety of ways - by ingestion, inhalation, contact through cuts, abrasions, intact skin, mucous membrane or conjuctivae.

What occupations are at risk?

Occupation	Disease
Health Services: medical staff, nurses, laundry staff, laboratory staff.	**Hepatitis B** (virus transmitted in human body secretions) **AIDS** (virus transmitted between humans) Plus range of other viral and bacterial agents.
Agricultural/farming/horticultural abattoir/slaughterhouse workers and animal handlers in general.	**leptospirosis** (bacterial disease; transmitted in urine from food animals, domestic animals and rats. **brucellosis** (bacterial disease; principally transmitted from cattle) **Q-Fever** (Rickettsial agent, sheep, cattle)

	anthrax (bacterial disease from animals and contaminated animal products) **ringworm** (fungal) **external parasites** (flea, lice, ticks). **internal parasites** tapeworm, (from dogs), roundworm. **swine erysipelas** (swine fever - bacteria) **tetanus** (bacteria) **tuberculosis** (bacteria) **farmers lung** an asthma type allergy (fungal from mouldy hay, compost.
Restaurant and food preparers and handlers	**Salmonella** (bacterial from humans, birds and animals.

Prevention and Control

1. Disease eradication programmes e.g. brucellosis by vaccination and slaughter, herd TB testing and slaughter.

2. Engineering controls, e.g. dust control using local exhaust ventilation and extraction systems.

3. Education - people should be aware of the infectious agents to which they may be exposed and the specific precautions to be taken.

4. Hygiene - education and training in personal and industrial hygiene can help to avoid many diseases. Adequate washing and disposals facilities should be provided. Wash hands after handling animals and animal products/fluids.

5. Immunization e.g. for tetanus, Hepatitis B, Q-fever, rubella.

6. Personal protection - gloves, clothing

7. Notification - a number of diseases are "notifiable" to the health authorities (including anthrax, brucellosis, leptospirosis, hydatid, tetanus).

Activity

Draw up a list of the basic hygiene precautions you should take when handling food, animal products and livestock.

What precautions do you take before you eat lunch or leave work?

Discuss what biological hazards there are in your trade and what immunisations you should have.

Resources

1. Department of Employment and Industrial Relations, 1984, *Occupational Hygiene at Work*, AGPS, Canberra, Australia.

2. Health Commission of New South Wales, *Handbook of Common Zoonotic Diseases Associated with Food Animals (Incorporating a Code of Practice for the Protection of Workers in Abattoirs, Slaughterhouses and Knackeries*, Health Commission of New South Wales, Australia.

3. Department of Health, New Zealand, 1984, *Diseases Arising from Occupation, Chapter 12*, Department of Health and Department of Labour, New Zealand.

4. Department of Health, New Zealand, 1984, *Agricultural Health*, Department of Health, New Zealand.

5. Department of Labour and Industry, *Rural Industry Safety No. 5: Animal Handling*, DLI, Victoria, Australia.

MACHINERY HAZARDS

Machines are used extensively in all trade areas. These range from large presses to hand tools. Hazards arise from the use of machines when there is uncontrolled access to an energy source(s), either mechanical or non-mechanical. Injuries from mechanical hazards include trapping from in-running nips on rollers and conveyors, impact with moving parts or components, contact with sharp and abrasive surfaces, entanglement with moving and rotating parts and from ejection of machinery parts and components. Non-mechanical hazards include noise, fire and explosion, chemicals, heat, cold, radiation, electricity and biological agents.

Risk Assessment

Two questions to ask are:

1. How could harm occur and how probable is it?

2. What is the likely severity of the injury?

The combination of probability of injury and the severity provide a measure of the overall risk from using a machine. Clearly with some machines the risk is much higher than with others and require risk reduction.

Prevention of Machinery Accidents

The basic principles of prevention are achieved by technical, procedural or behavioural measures (usually a mixture of all three). These include:

Technical measures/design

- intrinsic safety i.e. machine design allows no access to dangerous energy source,
- machine and guard design to reduce need for access,
- guard design to reduce ease of access,
- ergonomic control layout to reduce human errors.

Procedural measures

- planned maintenance and inspection of machines and guards,
- permit to work procedures e.g. to ensure isolation from all energy sources during maintenance,
- clearly defined systems of work.

Behavioural measures

- training in basic skills, systems and procedures,
- instruction and supervision

All States have legislation requiring adequate guarding of machinery (machine guarding was our earliest health and safety legislation).

The following checklist can be used as part of a system to assess the safety of any machinery or tool and indicates the likely injury or accident that may result from unsatisfactory design.

Machinery and Equipment	**What might go wrong**
1. Is equipment or machinery difficult to operate?	Fatigue and errors
2. Are controls hard to reach?	Falls while reaching
3. Does movement of controls require excessive effort?	Fatigue, strains
4. Can controls be moved without placing hands, wrists, arms, or body in unusual positions?	Strains, sprains in arms, back, tendonitis, teno-synovitis, carpal tunnel syndrome.
5. Are emergency shut offs accessible from locations where an operator might get caught?	Increased severity of accident if not accessible.
6. Are lockouts provided and are they foolproof?	Possible injury/accident.
7. Are the functions of all controls labelled or readily apparent?	Accidental starting by other people.
8. Are the functions of controls logical and compatible with operator stereotypes or expectancies?	Mistakes in emergencies, e.g. starting machine instead of stopping
9. Are foot pedals used to operate operate equipment?	Tripping machine while hands are in point of operation
10. Are foot pedals guarded?	Objects falling on pedal, accidental trip
11. Are foot pedals used by standing operators?	Fatigue from standing on one foot.

12.	Are all guards and safety devices in used and in good working condition?	Trapping, entanglement, impact, contact injuries.
13.	Do they interfere with operation or maintenance in any way?	Taken off because in the way

Hand Tools

1.	Are tools difficult to hold?	Fatigue, sore hands, dropped tools
2.	Are tools too heavy?	Fatigue, dropped tools
3.	Are there sharp edges?	Cuts
4.	Are there nip points?	Cuts, pinches
5.	Is use of tool difficult (e.g. hard to squeeze, twist, slippery, etc.).	Fatigue, errors
6.	Does tool vibrate?	Fatigue, "white finger disease", Raynaud's Disease
7.	Are power tools noisy?	Hearing damage
8.	Does use require unusual or uncomfortably hand wrist arm, shoulder or body position?	Tendonitis, carpal tunnel syndrome, tenosynovitis, synovitis, medial nerve disease, muscular pain in arms, neck, back.

Activity

1. Design a safety checklist for a piece of equipment you routinely use at work. Discuss the checklist with your work supervisor and college trainer.

2. Choose a piece of equipment you use at work and write a "procedures for operation" for it.

Resources

1. Parmeggiani, L., (ed), (1983), *Encyclopedia of Occupational Health and Safety*, 3rd Edition, International Labour Office, Geneva.

2. British Standards Institute, (1988), *Code of Practice for Safety of Machinery BS 5304:1988*, BSI, England.

THE HOME AS A WORK AREA

When is the home a work area?

The home is the site of many occupational health hazards. Recently, home work and outwork have become more common. The major areas for this type of work are:

- clothing
- process work
- office work, especially typing and bookkeeping
- childcare
- computer work, especially data processing and word processing

In addition, a number of categories of worker have other people's houses as their workplace e.g. childminders, gardeners and domestic cleaners.

Health hazards for home work and outwork

Basic workplace standards for health and safety are rarely enforced when the home is a workplace. Particular problems include:

- lack of ventilation and temperature control, especially when fabric dust and fibre are present
- overuse injuries
- back pain
- headaches
- skin irritations
- minor industrial accidents
- stress
- electric shock
- burns

Work organisation is frequently poor, with home workers subject to long hours, low pay, piece work with no sick leave, long service leave or holiday leave or penalty rates.

The very nature of piece work - payment for unit produced - encourages the relaxation of safety standards for greater income.

Some apprentices, who do extra work at home to supplement their income, may find that stress, overtiredness etc. may adversely affect their normal work performance.

Home work and outwork are frequently combined with childcare responsibilities, which places added stress on the worker.

Prevention and control

* Promulgation of information about occupational health and safety through the entire community.

* Registration, licensing and unionising of home workers and outworkers so that they are aware of their health and safety rights and responsibilities.

* Enforcement of minimum standards in terms of hours and conditions as well as inspection of workplace standards.

* Extension of provision for community and industry based childcare, so that more workers have a choice about their workplace.

* Limiting hours worked and taking regular breaks.

Activity

List the advantages and disadvantages of home work and outwork from the point of view of health and safety.

VEHICLE AND ROAD SAFETY

Vehicle accidents, either at work, or to and from the work place, are a major cause of occupational injury and lost time. In agriculture, the tractor is the major cause of injury and death.

Vehicle safety

The general principles of regular inspection, preventative maintenance and operational inspection should apply to the operation of any vehicle. Operational procedures should emphasise safe place controls and reliance on behavioural controls should be minimised wherever possible.

Motorised vehicles should meet the following safety requirements:

- efficient foot and hand brakes.
- the driver's/operator's seat should be comfortable and should provide the driver/operator with a good field of vision.
- the controls should be within easy reach and easy to operate.
- easy access to the driver's/operator's seat.
- a stopper or a close-off valve under any tip-up load platforms.
- any load should be well-anchored.
- exhaust system discharging away from the operator's position.
- first aid kit and any necessary personal protective equipment in the operator's cab, depending on what is being transported.
- fire extinguisher.
- vehicles carrying dangerous goods should carry emergency procedure sheets in the cabin.

The general safety measures listed above should be used to reduce the number of industrial accidents connected with vehicles.

Trucks are often involved in accidents leading to foot injuries. Most injuries occur during loading and unloading. The person helping the driver/operator often runs the greatest risk. Both driver/operator and helpers should wear protective shoes.

Forklift Safety

Forklift drivers should receive basic training prior to using a forklift in a work situation. This should include:

- basic mechanical operation and;
- safety rules and tips for operators.

Forklift operators should comply with State/Territory legislation with respect to learners licences, certificate of competency and full licence.

The following are some safety rules and tips for Forklift Truck operators:

* Know the rated capacity of the truck ... overloading is damaging and costly.

* Report evidence of faulty truck performance.

* Never travel with the forks raised ... when loaded your vision is obstructed: unloaded they threaten everybody's safety.

* For better vision with bulky loads, drive backwards.

* Watch blind corners - stop at intersections and sound horn.

* Use slow speed control when descending ramps.

* Turn switch-key off when leaving machine.

* Operate at safe speeds.

* Watch for unstable loads and stacks.

* Keep load against carriage ... tilting back the upright steadies the load when in motion.

* Spread forks to suit the load width ... keep the load well-balanced laterally; forks too close together cause swaying loads.

* Lower loads slowly - stop them gradually ... avoid severe strains on the hydraulic system; your truck will last longer.

* Don't lift or lower loads while travelling ... travel with loads about 15cm above the floor.

Tractor Safety

The same general rules that apply to forklift operation apply to tractor operation. All new tractors must be fitted with protective cabs or roll over frames unless specifically exempted.

Ideally all tractors should comply with the Australian Standard AS1636-1984 which deals with protective cabs and frames for agricultural wheeled tractors and in some States there is a rebate for operators who retro-fit safety frames.

General safety precautions include:

* Check the vehicle each day before starting operations - tyres, ballast, brakes, steering, hydraulic lines.

- Keep all guards in place e.g. power take off guards, roll over frame/cab, rear wheel guards.
- Keep children away from tractors and machinery (one in four of those killed in tractor accidents are children).
- Do not operate in a poorly ventilated area - exhaust fumes are poisonous.
- Ensure that the operator is properly trained.
- Do not carry passengers unless a safe secure seat and adequate foot rest and hand holds are provided.
- Ensure that all controls can be operated comfortably and safely from the seat.
- Before starting check to ensure that tractor is in neutral and the brake is on.

Cranes

Work involving cranes and overhead travelling cranes must always be performed under supervision of a qualified and experienced person. The workers must be suitably trained. In many cases special training may be required, including the correct signalling procedure for giving instruction to the driver. In this way misunderstanding and unnecessary risk of accidents can be avoided.

Activity

Design a vehicle safety checklist for your own vehicle or for your organisation's vehicle.

Resources

1. Department of Labour, *The Workcare guide to safe tractor operation*, Workcare Prevention, DOL, Australia.

2. Accident Compensation Corporation, *Tractor Safety*, ACC, New Zealand.

3. Department of Employment and Industrial Affairs, *Forklift Truck Operators - safe practices and useful information*, DEIA, Queensland, Australia.

4. Standards Association of Australia, 1983, *Guards for agricultural tractor PTO drives, AS1121-1983*, SAA, Australia.

5. Standards Association of Australia, 1984, *Agricultural wheeled tractors - roll-over protective structures - criteria and tests, AS1636-1984*, SAA, Australia.

6. Standards Association of Australia, 1979, *Protective structures for operators of earthmoving machines, AS2294-1979*, SAA, Australia.

7. Standards Association of Australia, 1978, *Rules for the guarding of agricultural tractors and machinery, AS2153-1978*, SAA, Australia.

8. Committee on Occupational Safety and Health in Commonwealth Government Employment, 1982, *Code of Practice 413 Tractors*, AGPS, Australia.

9. Committee on Occupational Safety and Health in Commonwealth Government Employment, 1977, *Code of Practice 408 Operating Forklift Trucks*, AGPS, Australia.

PERSONAL PROTECTIVE EQUIPMENT

In all the trades some form of personal protective equipment (PPE) is required at some time or another, to protect:

eyes (face shield, welders helmet, goggles, safety spectacles)
ears (ear plugs and muffs)
skin (gloves for chemicals, heat processes, cold processes, mechanical hazards)
head (safety helmets)
body (aprons, full body suits, dust coats)
feet (safety boots, gaiters)
respiratory system (half and full face piece, air filtering, air supplied etc.)

PPE is equipment used to eliminate or reduce the exposure or contact to injurious physical or chemical agents. PPE should only be used:

- as an interim measure before controls are implemented
- where control technology is not available to prevent exposure
- where controls are inadequate to prevent exposure
- during activities such as maintenance, clean up, and repair where pre-contact controls (substitution, isolation, engineering etc.) are neither feasible or an effective means of protection
- during emergency situations

A good PPE program contains the following elements:

- workplace survey: recognition and evaluation
- selection considers matching PPE to the hazard(s),
  advice from trained sales reps.
  instituting trials for the selection of particular models,
  physical comfort,
  costs and standards.
- fitting and wearing: to ensure equipment also fits i.e. respiratory or ear protection achieve an adequate seal, and are worn correctly.
- maintenance: inspection, care, cleaning, repair, proper storage.

Hearing Protection

Ear plugs and ear muffs should not be considered as the first option in hearing protection. Hearing protectors should be selected only after proper noise measurements have been conducted. Noise attenuation depends on the frequency characteristic of the sound, and it is important that octave band analysis or at least dB(C) and dB(A) are taken to enable correct selection of protectors. There is no way of knowing whether adequate hearing protection is being provided unless these tests are conducted.

Ear muffs and plugs should conform to AS1270, *Hearing Protective Devices, 1983.*

The booklet, *Attenuation of ear protectors*, 5th Ed. National Acoustic Laboratories, Commonwealth Department of Health, 1984, provides the methods for selecting hearing protectors and data on hearing protector attenuation.

Instruction in correct fitting, maintenance and use is essential. Removal of protectors for even short periods can offset the protective effect for the rest of the day. Ear muffs also deteriorate with time - the seals become damaged, head band loses tension. In addition, they need to be regularly checked and cleaned.

Respiratory protection

Air purifying respirators will be the principal type of respirators used in most work situations although powered air purifying respirators are becoming more common for general industrial use e.g. aluminium smelting, asbestos work. Full face piece air supplied, SCUBA type, are typically used in emergency situations.

Great care must be taken with the selection of air purifying respirators. No respirator is suitable for all applications. Selection, education and maintenance play a critical role if respirators are to protect rather than give a "false sense of security". They must be personally fitted, and chosen to suit the workplace conditions. A filter designed to stop dust, for example, will be ineffective against chemical fumes - so it is essential to ensure that protection against a contaminant encountered in the workplace is by means of the appropriate filter.

All respirators need to be inspected by the user before being worn. Therefore all users need to know what to look for when inspecting their respirators. The following is a checklist of things to look for before using a respirator:

1. Ensure that the correct cartridge or canister has been selected for the job. Check that it is fitted correctly (cartridges should have an arrow on them to indicate which side goes towards the face). Check that the cartridges/canisters are undamaged and that the filter to facepiece seal is good.

2. Check the facepiece for cleanliness and damage (that it is not cracked, torn, split, perished or distorted).

3. Check that the valves are intact, not perished and are working correctly. Check the valve seal for dirt or other obstruction.

4. Check that all the straps are present and in a good condition and that the clips or fasteners are undamaged.

Respirators should be tested for fit before use. This can be achieved using "negative pressure test" which consists of sealing the filter with a plastic film, inhaling gently until the mask collapses slightly and holding your breath for 10 seconds. If the fit is not adequate, air will leak in and the mask will resume its normal shape.

A better test is to use a saccharine spray for particulate filters. The worker is first tested for saccharine sensitivity using a dilute saccharine solution (0.83g/100ml) in a nebuliser or sprayer. If the subject can detect the sweet taste when sprayed in their breathing zone then proceed to fit the respirator. Concentrated saccharine solution (83g/100ml) is sprayed around the edge of the seal. Subjects should breathe normally, move their head from side to side, up and down, talk etc. to simulate work procedures. If the sweet taste can be detected then the fit is deemed to have failed.

For chemical vapour and gas cartridges a volatile and non-toxic chemical is used - this is usually isoamyl acetate (banana oil). The test is conducted as above after first ensuring that the subject is sensitive to isoamyl acetate i.e. can detect its smell.

Large suppliers of respirators may have access to "quantitative fit test" apparatus. This type of equipment actually measures the contaminant level outside and inside the respirator during use. This gives by far the most accurate assessment of fit enabling a protection factor to be determined (protection factor is the ratio of the outside contaminant to that inside the respirator. Half face types are generally rated between 5 and 10. In other words, if the operator is exposed to a toxic contaminant at 10 times the Exposure Standard a half face respirator will reduce the exposure to around the Exposure Standard (for definition of Exposure Standards see the Glossary). The implication is that a more effective device should be selected - i.e. one with a higher protection factor).

Respirators should be inspected regularly for defects, and cleaned and stored properly. It is very important that the respirators should be sanitised after each use to prevent infection. After cleaning, the respirator should be stored in a sealed plastic bag; this will prolong the life of the cartridge which will continue to adsorb contaminants even it not worn.

The filters and cartridges should be replaced regularly - how often will depend on the concentration of the contaminant and the working load. The manufacturers' recommendations should be followed.

Disposable particulate masks require no maintenance or cleaning. The same factors for selection and fit apply.

Half or full facepiece respirators should not be worn if:

facial hair interferes with the seal,
contact lenses are worn,
there is a complicating medical condition (e.g. emphysema, pulmonary disease, coronary artery disease, breathing difficulty when wearing a respirator, claustrophobia).

Gloves

There is a wide range of protective gloves available for most industrial situations.

Gloves are one of the most important ways of preventing skin damage from mechanical hazards and skin absorption of chemicals. However, there is no one glove that will protect against all chemicals. For correct selection for the particular chemical class see Health and Safety Bulletin No. 50, *Guidelines on Occupational Skin Diseases, Part 2*, June 1987 ACTU-VTHC for a comprehensive chemical-glove selection chart (prepared by the S.A. Health Commission) and consult the manufacturer/supplier specifications. Do not use gloves if they swell. Permeation may occur with consequent skin absorption of the chemical.

Eye/Face Protectors

These are essential items of PPE in any workshop. New technology finishes provide non-fogging surfaces. They should conform to AS1336-1982. Ensure selection is appropriate to the use: choose an impact resistant plastic face shield/glasses for protection against flying particles; a chemical resistance plastic face shield for handling chemicals; the correct shade of eye-piece for the particular welding process. A range of safety sunglasses are available and should be used where protection from glare and other physical/chemical hazards are required.

Activity

1. Draw up a table listing:

   your various job activities,
   airborne contaminant produced for each process,
   the respirator/filter types you would need for the job.

Resources

1. AS1223-1982, *Safety requirements for industrial hand cleaners*, Standards Association of Australia.

2. AS1269-1989, *Hearing Conservation*, Standards Association of Australia.

3. AS1270-1983, *Hearing protection devices*, Standards Association of Australia.

4. AS1336-1982, *Recommended Practices for Eye Protection in the Industrial Environment*, Standards Association of Australia.

5. AS1558-1973, *Protective clothing for welders*, Standards Association of Australia.

6. AS1698-1980, *Protective helmets for vehicle users*, Standards Association of Australia.

7. AS1715-1982, *Selection, use and maintenance of respiratory protective devices*, Standards Association of Australia (1989 draft in progress).

8. AS1716-1984, *Respiratory protective devices*, Standards Association of Australia (1989 draft in progress).

9. AS1800-1981, *The selection, care and use of industrial safety helmets*, Standards Association of Australia.

10. AS1801-1981, *Industrial safety helmets*, Standards Association of Australia.

11. AS1891-1983, *Industrial safety belts and harnesses*, Standards Association of Australia.

12. AS2063, *Lightweight protective helmets*, Standards Association of Australia.

13. AS2161-1978, *Industrial safety gloves and mittens (excluding electrical and medical gloves)*, Standards Association of Australia. (1989 draft in progress).

14. AS2210-1980, *Safety footwear*, Standards Association of Australia.

15. AS2225-1978, *Rubber gloves for electrical purposes*, Standards Association of Australia.

16. AS23750-1980, *Guide to the selection, care and use of clothing for protection against heat and fire*, Standards Association of Australia.

18. AS2568-1982, *Purity of compressed medical breathing air*, Standards Association of Australia.

19. AS2626-1983, *Industrial safety belts and harnesses*, Standards Association of Australia.

OCCUPATIONAL FIRST AID

An essential element in reducing the extent of distress and injury to an accident victim is the way in which immediate assistance is given to them.

The period of time between when the accident occurs and trained medical assistance reaches the victim is often crucial. Sometimes it means the difference between life and death and that's why it is essential for the basics of first aid to be understood by personnel "on the job".

Current training in occupational first aid emphasises the recognition and reporting of health hazards and training in first aid should be considered an important element in preventative strategies to assist in providing a healthy and safe work environment.

State legislation requires companies with over a certain number of employees to provide a comprehensive health service. In all companies first aid equipment and materials should be readily available for treating industrial injuries or sickness. Minimal equipment should be a first aid kit, stretcher and blankets. A person with first aid training should always be on the premises. First aid requirements for industry are included in State/Territory legislation.

Activities

1. What first aid facilities would be required in your workplace/work area?

2. Check out whether a first aid kit is nearby to your work area/work station. Does it have the appropriate items necessary for treating an accident which could occur in your work area?

3. Find out what sort of skills a first aid trained person should have.

4. How would you deal with a serious accident that could occur in your workplace?

Resources

1. Queensland Department of Employment and Industrial Affairs Division of Occupational Safety, 1986, *First Aid*, Queensland, Australia.

2. National Health and Medical Research Council, 1975, *Occupational Health Services*, NH&MRC, Australia.

3. National Health and Medical Research Council, 1980, *Occupational First Aid*, NH&MRC, Australia.

4. St. John Ambulance Australia, undated, *Occupational First Aid*, Australia.

5. Australian Red Cross Society, 1986, *First Aid Manual*, William Collins, Sydney, Australia.

APPENDIX 1: INDUSTRY SPECIFIC HAZARDS FOR TEN MAJOR TRADE AREAS

TRADE	HAZARDS AND CONCERNS	
	Physical ↓	Chemical/Biological ↓
BUILDING.	Noise/vibration. Heat/cold. Heights. Confined spaces. Radiation (UV, welding, EMR). OOS/Manual handling. Compressed air.	Acetylene. Metal fumes (from brass, zinc, copper, cadmium). Lead. Cement/concrete. PCB's. Coal tar pitch/ creosote. Epoxy resins. Asbestos. General purpose solvents (eg. Trichloroethylene, MEK). Isocyanates. Mineral Oils. Fuels. Plastics (PVC). Wood dusts. Man-made mineral fibre (rockwood, ceramic fibre). Silica. Acids/alkalis. Turpentine/white spirits. Poisonous insects, snakes. Bacteria/virus/ fungi.
	(Safety on Site - Occupational health and safety training. Victorian Building and Construction Industry Training Council, Melbourne, 1987.)	
VEHICLE.	Manual handling. Fire. Burns. Machinery/ tools. Radiation.	Fuels. Asbestos. Cleaning Fluids. Acids & caustic substances. Lead.

TRADE	HAZARDS AND CONCERNS Physical ↓	Chemical/Biological ↓
	Welding.	Spray paints/ isocyanates/ solvents. Dusts. Adhesives/ fillers. Vehicle exhaust fumes. Air conditioning units - freons. Metal fumes.
FOOD.		
Cooking - Baking, Pastry.	Heat/Burns. Humidity. Shiftwork - stress. Lighting. Manual handling. Machinery. Noise.	Water. Dermatitis/allergy. Detergents & cleaning agents. Dust. Biologically active agents in food stuffs.
Butchery.	Knives. Machines. Manual handling. Steam.	Allergies. Zoonoses (transmissible diseases of primary animal origin). Smoke. Detergents & cleaning agents.
	(Agricultural Health., Department of Health, Wellington, New Zealand, 1984.)	
AGRICULTURAL.	Machinery. Noise/vibration. Animals. Welding. Electrical equipment. Environment - heat, damp.	Chemicals/ pesticides/fuels /oils/solvents. Dusts (animal, vegetable). Diseases - transmissible.
	(Agricultural Health., Department of Health, Wellington, New Zealand, 1984.)	

TRADE	HAZARDS AND CONCERNS	
	Physical ↓	Chemical/Biological ↓
HORTICULTURAL.	Machinery. Noise/vibration. Heat/Humidity. Confined spaces (glass houses).	Chemicals/ pesticides/ solvents.
ELECTRICAL.	see also Building trades.	
- Electrical Mechanics.	Electrical machinery. Heights. Noise/Vibration. Confined spaces. Fire.	Asbestos. Working with plastic conduit - fumes, solvents. Soldering (metal fumes).
- Electrical Fitting./ Armature Winding.	Welding - radiation.	Solvents. Resins. PCB's. Metal fumes.
METAL.		
Boiler makers.	Noise. Heat. Radiation. Confined spaces. Manual handling. Electricity. Fire.	Metal Fumes. Metal Dusts. Solvents. Gases.
HAIRDRESSING.	Stress. Electricity. RSI/OOS Poor ventilation. Sexual harassment Slips, falls	Dermatitis. Solvent exposure. Water. Carcinogens (dyes). Contagious diseases (contracted from clients).

TRADE	HAZARDS AND CONCERNS	
	Physical ↓	Chemical/Biological ↓
PRINTING	Manual handling (back injuries). Noise. Screen Based Equipment /VDU's. Machinery (printing, binding). RSI/OOS. UV radiation.	Dermatitis. Solvents exposure - chronic and acute. Metals (lead, cobalt, chrome). Chemicals used in printmaking, platemaking, photography, binding. Glues/solvents/ coatings.
	("Health and Safety Guide for the Printing Industry" - P.K.I.U., Surrey Hills, Sydney, "Chemicals at Work" - P.K.I.U.)	

APPENDIX 2: SAFETY AND HAZARD AUDIT

The purpose of this safety audit is to allow someone with minimal training in hazard identification to identify health and safety problem areas in their workplace and to provide an indication of the appropriate control for the problem.

A wide range of hazards are encountered in the trade areas. They can be broadly divided into two groups: the physical environment e.g. noise and lighting, and the chemical environment. A third group, the biological environment, is important in some workplaces e.g. farms and hospitals.

The control of hazards may require a blend of strategies, however the control should attempt to maximise safe place controls and minimise reliance on behavioural or safe person controls.

The following is a hierarchy of control strategies:

1. Eliminate the hazard at source (by a change of process or design);

2. Replace the hazard with a safe(er) substitute;

3. Reduce the hazard using engineering controls:

    - prevent the hazard reaching the workers with local exhaust ventilation,
    - machine guarding,
    - containment,
    - improve design of tools, equipment and furniture,

4. Reduce the hazard by administrative and organisational methods:

    - improving work organisation,
    - modifying the workplace,
    - isolating the worker from the hazard.

5. Provide personal protective equipment - this should be properly fitted, regularly updated and replaced as required.

6. Provide education and training.

Many controls are self-evident once awareness of the hazard is appreciated, for example dust control in foundries, workshops.

This audit is designed as an educational tool, to be used flexibly and to be modified as need, or its short comings, dictate.

SAFETY AND HAZARD AUDIT

Institution/Firm/Enterprise Date

Department

Department Head/Supervisor Technical Staff

I	Organisation and Administration	Response
1.	Is there a safety policy? Is it readily available? Where? Is the safety policy prominently displayed?	
2.	Is there a properly constituted safety committee (representative, meets regularly, agenda and minutes issued)?	
3.	Is there a safety officer or co-ordinator - does he/she play an effective role in safety management e.g. communication, promotion of safety and health programmes?	
4.	Are standing instructions displayed prominently and up to date? (may include instructions for use of equipment, safety systems, permit to work, smoking policy, fire and emergency procedures etc.).	
5.	Is there a system of accident reporting? Does the report form enable information to be gained on how and why an accident occurred? Can the accident report be developed to include illnesses and dangerous occurrences e.g. recurrent headaches or dizziness may indicate exposure to a solvent - is this a ventilation problem or a personal sensitivity? Another example is dermatitis - it isn't generally considered an "injury" but it is a significant occupational risk amongst a range of workers (printworkers, building trades, hairdressing, food trades). Are accident/illness reports completed? Are the accident/illness reports analysed? (records of problems can provide valuable information for hazard identification and control).	

Response

6. Is there a purchasing policy to assess new equipment and materials for compliance with standards and to minimise or eliminate hazards from materials/equipment?

Comments/suggested improvements

II Education and Training

1. Are workers provided with information regarding general or specific workplace hazards?

2. Is education and training in general behaviour and hazard awareness carried out?
Are staff/safety co-ordinator/safety committee representative adequately trained in health and safety problems particular to the trades?

3. Is health and safety an integrated component of trade instruction (verbally and in course syllabuses)?

4. Are there first aid stations/officers in the department?
Are first aid kits regularly checked?
By whom?

5. Is education and training ongoing with new processes or new chemicals?
Is there training in use of hand and power tools and other equipment?
Is there training in the use of PPE? (see supplement on machinery and PPE selection).

Comments/Suggested Improvements

III	Hazard Control	Response
1.	Is there provision of safe access and egress (see also fire control)?	
2.	Are materials, equipment and tools safely and correctly stored?	
3.	Are all dangerous parts of machinery adequately guarded? Are emergency stop buttons accessible from locations where an operator might get caught? Is there appropriate personal protective equipment (PPE) provided (goggles, ear muff etc.)?	
4.	Are there adequate facilities for materials handling, i.e. lifting and transport of heavy and bulky loads?	
5.	Are work areas kept clean and free of obstructions?	
6.	What is the condition of electrical equipment? Is equipment regularly maintained and checked? Are electrical cables checked for wear or damage?	

Comments/Suggested Improvements

IV	Fire Control
1.	Are combustible and flammable materials safely stored e.g. flammable chemicals (solvents, turpentine etc.) in a fire proof safety cabinet; paper, solvents, paints away from sources of ignition? Are large quantities of flammable materials e.g. greater than 4 gallons or 20 litres stored in a purpose built storage area and away from general work areas? Is there adequate warning through placards and signs?

Response

2. Are stair wells maintained free of flammable materials?

3. Are means of escape marked and kept clear?
Are fire hoses accessible in an emergency?

4. Is there provision of adequate fire extinguishers of types appropriate to the risk?
Are the fire extinguishers labelled for their suitability in fire fighting?
Are the fire extinguishers clearly sign posted? (with a sign at a height that allows identification across a crowded room).
Are fire blankets available in high risk areas? e.g. foundry tapping operations.

5. Are there written procedures "In case of Fire" on display?

6. Are regular fire drills held?
Do these include the use of fire extinguishers and other fire fighting equipment?

Comments/Suggested Improvements

V Chemical, Toxic, Corrosive, Gas and Dust Hazards.

1. Is there safe storage, labelling, handling, use and disposal procedures for toxic and corrosive substances? (if no, see supplement on chemicals).

2. Is dust control effective; does dust accumulate on work surfaces and equipment? (see also ventilation).

3. Are appropriate hazards warning notices posted e.g. hazchem signs for LPG, welding gases, solvent stores etc.

Response

4. Is there a hazardous materials register:-
   is it kept up to date? How often?
   Are there Material Safety Data Sheets (MSDS) available for all chemicals and flammables? (MSDS sheets provide detailed information on physical and chemical properties, precautions for use, first aid treatment, protective equipment and procedures for dealing with spills).
   Are personnel fully acquainted with MSDS and trained to take necessary action in an emergency?
   Is there liaison with local hospitals? (in the event of an accident).
   If necessary, are antidotes to poisons available on site and at local hospitals?

5. Are emergency showers available and working? (these should be available in areas where there are risks of chemical spills or splashes or where clothing could catch alight).

6. Are eye wash stations provided in areas where chemicals or dusts could get into the eyes?
   Are they regularly maintained?

7. Are extraction systems working effectively? Is there regular maintenance of such equipment?
   Is an operator or other person(s) subjected to fumes, vapours, aerosols, or dusts from spraying, welding, painting, printing etc. (warning signs that levels may be too high are: vapours can be smelt, headaches, nausea, lethargy).

8. Are there adequate disposal procedures for chemical wastes?
   Does disposal meet with the requirements of the local authorities?

Comments/Suggested Improvements

VI	Environment	Response
1.	Is the heating/cooling of the work place controlled adequately for comfort? Does the work area require auxiliary heating? (some radiators may constitute a danger where flammable solvents are being used).	
2.	Do noise levels permit normal speech or telephone conversation?	
3.	Are the ventilation or extraction systems adequate to prevent irritation from vapours and dusts? Do people complain of regular headaches, nausea, lethargy?	
4.	Is adequate lighting provided? Do people complain of eye strains; headaches; fatigue etc.? Is lighting adjustable (positions and intensity) to a particular work requirement? Are there problems of reflection or glare from surfaces?	
5.	Are equipment and work stations adequately (ergonomically) designed for current needs? Does the work require excessive lifting, pulling or pushing? (do you have to unduly strain in awkward positions?)	
6.	Are there operations that could lead to repetitive strain injuries? Do you suffer from ache, pain or tiredness due to your work? Do symptoms persist overnight? Do the symptoms impair your ability to perform normal movements? A yes answer to these questions may indicate RSI.	

Comments/Suggested Improvements

VII Hygiene — Response

1. Are there adequate and clean toilet facilities?

2. Is adequate drinking water available?

3. Are there adequate locker facilities?

4. Is there provision of mess rooms or areas for tea/coffee making?
Is there provision for separate smoking areas (away from chemicals)?

5. Are there hand washing facilities in the work areas?

Comments/Suggested Improvements

VIII Personal Protection

1. Is the selection of personal protective equipment (PPE) adequate for the known hazard? e.g. are respirator cartridges selected for the appropriate vapour - acid, organic solvent etc.).
Is selection also based on suitability of fit, comfort and ease of maintenance?

2. Is training provided in the use of PPE, does this include correct fitting?
e.g. testing for effective fit of a respirator.

3. Is there regular inspection, cleaning, storage and maintenance of PPE?
(e.g. are respirators stored in sealable airtight bags?)
Who is responsible?

4. Is the PPE being used?

Comments/Suggested Improvements.

IX	Safe systems of work/permit to work systems	Response
1.	Are there equipment and processes that require special training in their use e.g. kilns, welders, moulders, fork lifts?	
2.	Is there a system in operation to ensure that only adequately trained person(s) operate this equipment or process?	
3.	Are there detailed written operating procedures for these processes or machines? Do these clearly identify safety and emergency procedures and the PPE to be used?	

Comments/Suggested Improvements

APPENDIX 3: GLOSSARY OF GENERAL HEALTH AND SAFETY TERMS

The following is a glossary of health and safety terms which may be useful to refer to when developing a curriculum.

Acclimatization Building up over time a resistance to or a tolerance for exposure to heat or cold. This results from repeated exposure but does have its limits.

ADG Code Australian Code for the Transport of 'Dangerous Goods by Road and Rail. See also Dangerous Goods Class. A Code prepared by the standing national Advisory Committee on the Transport of Dangerous Goods and endorsed by the Australian Transport Advisory Council. The code is based on recommendations prepared by the United Nations Committee of Experts on the Transport of Dangerous Goods. It covers the classification, packaging, marking and transport of dangerous goods.

Acuity (visual) Ability of the eye to discriminate fine detail. Use for SBE standard setting and an integral element of eye-testing.

Acute toxicity Effects that occur immediately or shortly after a single exposure.

Aerosol An aerosol is an airborne solid or liquid substance that may remain suspended in the air for long periods of time. Aerosols are primarily dusts, fumes and mists.

Air Sampling Testing procedure to measure airborne contaminants in a precise quantity of air.

Allergic reaction An over-reaction by the immune system to an antigen. It can take the form of a rash, asthma, weeping eyes and sneezing.

Allergic Sensitiser - see dermatitis.

Alveoli Small air spaces within the lungs where oxygen diffuses into the blood and carbon dioxide escapes. Damage to the alveoli can lead to lung disease.

Ames test A screening test using strains of bacteria in an attempt to determine whether a chemical has mutagenic effects.

Anemia A condition in which the number or quality of red blood cells in the body is greatly reduced or altered. People with anemia tend to suffer from weakness and fatigue.

Anemometer An instrument used for measuring the speed of air flow. It can be used to check ventilation systems.

Antidote A treatment for chemical overexposure which is specific (more or less) to the chemical or class of chemicals; in contrast to supportive treatment which maintains body functions.

Appearance A description of the physical state of the material.

Asbestosis A chronic lung disease which makes breathing more and more difficult; can cause death. The breathing difficulties are caused by the build up of fibrous scar tissue in the lungs usually after intensive exposure to asbestos dust.

Asphyxiant A chemical which acts as an asphyxiant is a gas, or can form a gas, which has little or no effect of its own, but which is present in high enough concentrations to cause a decreased oxygen supply and produce unconsciousness and death.

Asthma A lung disease in which the small air passages in the lung are in spasm, making breathing difficult.

Audiogram/Audiometer An audiometer is a machine used to measure an individual's hearing ability. The result of the hearing test is an audiogram, a graph that records a person's ability to hear sounds of different volume and pitch.

Australian Standard (AS) Standard published by Standards Australia, formerly the Standards Association of Australia.

Autoignition temperature The minimum temperature required to start or cause self-sustained combustion in any substance in the absence of a high temperature ignition source, such as a spark or flames. This is not applicable to many substances.

Benign Tumor Benign means harmless or not progressive. Therefore, a benign tumor is one that is generally not fatal and does not spread rapidly to other parts of the body. Certain types of benign tumors, however, may become malignant.

Biological exposure index This represents a warning level of biological response to a substance or agent, or warning levels of the substance, agent or its metabolites in the tissues, fluids or exhaled air of exposed workers. Biological exposure levels will be developed by the National Occupational Health and Safety Commission and are intended to be used in conjunction with other means of controlling exposure.

Biological Monitoring Another term to refer to medical tests (blood, urine, etc.) used to indicate the dose of a substance received by the body. The primary purpose of these tests is to determine human exposure to a hazard and they should not be seen as prevention. They may be part of a treatment program.

Boiling point The temperature at which the product changes to gas. Normally measured in ^{o}C at atmospheric pressure.

Bulk density Bulk density is the weight of a unit volume of powder, usually expressed in grams per cubic centimetre (g/cm^3). It is determined by a specific method. Apparent density is an alternate (but less commonly used) term for bulk density. See also density.

Cancer A malignant tumour which can spread to other organs of the body, as distinct from a benign tumour which cannot. (Although leukaemia and some other malignant diseases are not solid tumours, they meet other criteria for cancer and can be (and often are) included under this definition).

Capture velocity The velocity of air which is sufficient to capture a contaminant at its source causing it to flow into the hood.

Carcinogen An agent which is responsible for the formation of a cancer.

Carcinogenesis The causing of cancer.

Carcinogenic Capable of causing cancer.

Cardiovascular System The system of the heart, blood vessels, and circulation of blood.

Cataract A clouding over of the lens of the eye, causing a partial or total loss of vision. Leads to blindness if cataract is not surgically removed.

Caustic A corrosive chemical with a high pH (basic or alkaline).

Ceiling Limit The maximum concentration or level of a chemical, dust or physical agent that is allowed at any time.

Central Nervous System Depressant Chemical that can cause a slowing of the central nervous system activity in the brain and spinal cord. Results in dizziness, headache, loss of co-ordination, stupor, coma and possibly death. Many solvents are CNS depressants.

Central Nervous System Depression A lowering or decrease of function or activity of the central nervous system. Inhalation, ingestion, or skin absorption of substances like organic solvents can produce this condition. Symptoms, which can be progressive, may range from headaches and dizziness to mental confusion, eventual loss of consciousness, and even death.

Chest X-Ray A test to detect damage to lung tissue. Shows the appearance and location of fibrotic changes in the lungs.

CAS number or Chemical Abstracts Services number A number assigned to a single chemical by the Chemical Abstracts Services (a US-based reference service) which serves to identify that chemical. Some mixtures (but not many) are assigned a CAS number. This is the only "one-chemical-one number" system covering all publicly known chemicals.

Chromosome Part of the cell's genetic material. Damage to chromosomes can cause harmful changes to an individual's body and may also result in birth defects.

Chronic toxicity Harmful effects of a chemical which occur after repeated or prolonged exposure. Chronic effects may also occur some time after exposure has ceased.

Circadian Rhythms The daily patterns of the body's self-regulatory mechanisms, e.g. heart rate, production of hormones, temperature, sleep/wake cycles.

Circulatory System The parts of the body involved with the movement of blood. This includes the blood, blood vessels, and heart.

Code of Practice A practical guide for employers and workers on how to achieve a particular objective for health and safety at work. Codes of Practice do not have the legal force of Acts or Regulations. They should however be applied in the absence of a better solution or approach and may be used as evidence to support a prosecution.

Commercially confidential information Information (such as chemical identity or exact composition) which if made public would significantly damage genuine commercial interests.

Congenital Present at birth.

Conjunctivitis Inflammation of the delicate membrane that lines the eyelids and covers the eyeball (conjunctiva). May be caused by chemicals or other irritants or infection.

Contact Dermatitis Dermatitis of the skin due to direct contact with an irritating substance.

Contaminant Poison, toxic substance - anything that makes air or water unfit for human consumption or contact.

Correct Shipping Name Name for identifying substances classified as dangerous goods under the ADG Code. (Refer to the Code for further information).

Correct Technical Name This means in order of preference:

- the name of the substance as listed in section 9 and 10 of the ADG Code;

- the name of the substance in the Schedules of the National Health and Medical Research Council's "Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP)"; or

- a name commonly used in scientific and technical handbooks, textbooks and texts, which accurately identifies the substance.

Corrosive A substance which causes destruction of or damage to materials or living tissue on contact. For precise criteria for determining whether a substance is classified as corrosive under the ADG Code, refer to Section 2 of the Code.

Cumulative Additive effects of a substance with long-term exposure, particularly as it affects the same organ (lungs, liver, etc.).

Dangerous Goods Substances which are either specifically listed in the Australian Code for the Transport of Dangerous Goods by Road and Rial (ADG Code) or meet the classification criteria of Section 2 of that Code.

Dangerous Goods Class The class allocated to a substance under the Australian code for the Transport of Dangerous Goods by Road and Rail (ADG Code). Classification is according to the predominant type of risk involved:

Class 1 Explosives

Class 2 Gases: compressed, liquefied or dissolved under pressure

Class 2.1	Flammable gases
Class 2.2	Non-flammable gases
Class 2.3	Poisonous gases

Class 3 Flammable liquids

Class 3.1	Liquids with a flashpoint below 23°C (closed cup test)
Class 3.2	Liquids with a flashpoint of 23°C or more, up to and including 61°C

Class 4 Flammable solids

Class 4.1	Flammable solids
Class 4.2	Substances liable to spontaneous combustion
Class 4.3	Substances which emit flammable gases on contact with water

Class 5 Oxidising agents and organic peroxides

Class 5.1	Oxidising agents
Class 5.2	Organic peroxides

Class 6 Poisonous (toxic) and infectious substances

Class 6.1a	Substances which are liable to cause death or serious injury to human health if swallowed, inhaled or ingested
Class 6.1b	Substances which are harmful to human health if swallowed or inhaled or by skin contact
Class 6.2	Infectious substances

Class 7 Radioactive substances

Class 8 Corrosives

Class 9 Miscellaneous dangerous substances

Dead Finger Damage to the hand due to vibration, causing whiteness and pain in the fingers. Also called white finger.

Decibel (dB) A unit used to measure sound pressure level or sound intensity. To account for the ear's response to different frequencies, a special "A" weighting is applied i.e. dBA. The dBA unit is generally used for noise exposure surveys in the workplace.

Density Ratio of mass of a substance to its volume. It is usually measured at 20°C and expressed in grams per cubic centimetre (g/cm^3). See also bulk density.

Dermal Relating to the skin.

Dermatitis Inflammation of the skin. **Irritant contact dermatitis** is direct damage to the skin which is due to contact with the irritant substance (for example, acids, alkalis, organic solvents) in sufficient concentration and for sufficient time. It occurs soon after exposure and persists long after exposure has ceased. **Allergic contact dermatitis** is an inflammatory reaction caused by substances which penetrate the skin and cause a specific allergic response (sensitisation) after a variable lag period ranging from a matter of days to several months. Once sensitisation has occurred, exposure to only a relatively small quantity of the substance will trigger a reaction within 48-96 hours due to developed hypersensitivity of the body.

Diffusers Shields fitted to light sources to reduce direct glare and spread light evenly.

Dilution Ventilation A type of general ventilation to be used for providing fresh air in the plant. This usually means installing fans in the roof or sides of the plant. Those in the roof usually pull stale air out of the plant and thus pull fresh air in through windows or make-up air units. Fans in the side of the plant usually pull fresh air into the plant directly. Dilution ventilation is not effective as a way to control direct exposures to chemicals.

Direct-Reading Instrument An instrument that gives an immediate indication of concentration of an airborne contaminant by some means such as a meter or the changing colour of a chemical. Some types are simple to operate and can be used by workers to check for hazardous levels of substances in the workplace.

Dosimeters A range of instruments used for measuring levels of exposure of radiation, noise, carbon monoxide, etc.

Dose The quantity of a substance or a physical agent at the site of effect. The site may be the whole body, the skin or particular organs. Rarely measured accurately.

Dose-Effect The relationship between a given dose and the size of observable biological effects in a specified proportion of the population.

Dose-Response The "cause and effect" relationship. The expected range of health effects in the total population following exposure to specific agents.

Dusts Fine, solid, powdery particles, varying in size, that do not diffuse in air, but eventually settle because of gravitational force. They are distributed by air currents. Suspension of solid particles in the air.

Earth The connection of containers to ground to prevent shocks and sparks.

Eczema An allergic skin rash.

Electro-cardiogram A measure of the electrical activity of the heart muscle.

Embryotoxic Causing toxic effects during early pregnancy.

Emphysema A destructive lung disease in which breathing gets more and more difficult because the alveoli in the lungs are damaged and break down. This reduces the ability of the lungs to pass oxygen into the bloodstream.

Engineering Controls Changes to the design of plant and work processes to eliminate or control worker exposure to hazards.

Entity A single chemical.

Epidemiology The study of the occurrence of illness/disease.

Ergonomics Analysis and design of work processes and equipment to suite the humans who work in a given situation.

Evaporation The change of a substance from a solid or a liquid into the gaseous phase.

Evaporation Rate The ratio of the time required to evaporate a measured volume of a liquid to the time required to evaporate the same volume of a reference liquid (usually ethyl ether or butyl acetate). The higher the ratio, the slower the evaporation rate. The term relative evaporation rate is also used to describe the above ratio.

Explosive Limits See flammability limits.

Exposure Quantity of contaminant present in the immediate area of the worker. Must be measured over time and with record of variations and other factors which may influence actual dose receive by a worker.

Exposure Standard An exposure standard represents an airborne concentration of a particular substance in the worker's breathing zone, exposure to which, according to current knowledge, should not cause adverse health effects nor cause undue discomfort to nearly all workers. The exposure standard can be: Time-Weighted Average (TWA), Peak, Short Term Exposure Limit (STEL) or General Excursion. The applicable exposure standard, when calculated as defined, shall not be exceeded.

Exposure Standard - General Excursion Where a "peak" or "STEL" is not specified, the airborne concentration of a particular substance, measured over a period not exceeding 15 minutes, should not exceed three times the TWA exposure standard for more than a total of 30 minutes per eight-hour shift and under no circumstances should the values exceed five times the TWA exposure standard, provided that the TWA exposure standard is not exceeded.

Exposure Standard - Peak A maximum or peak airborne concentration of a particular substance determined over the shortest analytically practicable period of time.

Exposure Standard - STEL The airborne concentration of a particular substance, averaged over a period of 15 minutes, should not be exceeded at any time during a normal eight hour working day. Workers should not be exposed at the STEL concentration continuously for longer than 15 minutes, or for more than four such periods per working day. A minimum of 60 minutes should be allowed between successive exposures at the STEL concentration.

Exposure Standard - Time-Weighted Average (TWA) The average airborne concentration of a particular substance when calculated over a normal eight hour workday, for a five-day working week.

Fetotoxic (foetotoxic) Causing toxic effects during pregnancy.

Fibrosis A thickening associated with growth of scar tissue usually in the lungs.

Flammability The property describes a danger of the product catching fire and under what conditions.

Flammability limits The range of concentrations of a flammable vapour in air at which a flame can be propagated or an explosion will occur, if a source of ignition is present. Normally expressed as upper and lower limits of this range (as percentage of the volume of vapour in air). The term Explosive Limits means the same as flammability limits.

Flammable Capable of being ignited and of burning in air, or in the case of flammable liquids those which have a flashpoint not greater than 61°C.

Flashpoint In general terms, the lowest temperature in °C at which a liquid will produce enough vapour to ignite, if the vapour is flammable. For a specific definition for the purposes of classifying substances under the ADG Code, refer to the Code. Flashpoint is established by closed or open cup methods. The lower the flashpoint, the higher the risk of fire.

Fumes Extremely small, solid particles produced through a process involving the vaporization and subsequent condensation of solids, usually metals. They are generally produced when metals are heated above their melting points, for example, in welding or soldering.

Gas A state of matter that has no definite volume or shape, and which can expand and contract in response to changes in temperature and pressure and will diffuse to fill a space.

Gastrointestinal (GI) Tract Body system including mouth, oesophagus, stomach, small intestine, and large intestine (colon).

Gene The material contained within cells responsible for determining inherited characteristics.

General Duty Requirement in legislation for employers to provide and maintain healthy and safe work practices.

Generic Name A means of classifying a group of things (usually chemicals) according to some basic characteristics in common. Can be misleading if used as a guide to health effects.

Genotoxicity The effect of causing damage to genetic material.

Hazard The possibility that exposure to an agent (physical, chemical or biological) will cause injury or harm.

Hazard Data Sheet See Material Safety Data Sheet.

Hazchem Code The Hazchem emergency action code of numbers and letters gives information to emergency services. Its use is required by the Australian Code for the Transport of Dangerous Goods by Road and Rail.

Heat Cramps The muscles used to perform a job develop painful spasms (usually in the legs, arms, or abdomen) as a result of exposure to excess heat.

Heat Exhaustion A condition usually caused by loss of body water because of exposure to excess heat. Symptoms are - headache, tiredness, nausea, giddiness and sometimes fainting.

Heat Stroke The most serious disorder resulting from exposure to excess heat. Heat stroke results from sweat suppression and increased storage of body heat. Symptoms are: hot dry skin, high core temperature (usually above 40°C and rising), mental confusion, loss of consciousness, convulsions and coma. Heat stroke is usually fatal unless treated QUICKLY and CORRECTLY.

Heritable Capable of being inherited.

I.A.R.C. The acronym for the International Agency for Research on Cancer.

Identification A section of an MSDS providing information on the name of a product, some of its other names, its use, properties and chemical composition.

Ignition Setting fire to or being set fire to.

Incidence The number of cases of a particular injury or disease reported in a particular period of time (e.g. one year).

Incompatability A situation where any substance or residue which by combining chemically with the incompatible substances or promoting self-reaction or decomposition of the incompatible substances, may create a hazard.

Industrial Deafness A name given to permanent hearing loss due to exposure to noise at work.

Ingestion Taking a material into the body by mouth (swallowing).

Inhalation Taking into the body by breathing in.

Interaction Modification of toxic effects of one substance by another. The effects can be amplified (synergism) or reduced (antagonism).

"In Vitro" Tests Simple, inexpensive laboratory screening tests using bacteria rather than more complex living organisms to detect *mutagens* and *carcinogens*. The tests are based on the fact that *genetic* material is the same in all living organisms. The most popular test for detecting mutagens is the Ames test. It can also be used to detect carcinogens.

Ionizing Radiation High-energy radiation (x-rays, beta-rays, gamma rays, alpha particles) that can destroy living matter. Capable of causing cancer and genetic effects.

Irritant A substance that will produce local irritation or inflammation on contact with tissues and membranes such as skin or eyes, or with nasal or lung tissue after inhalation.

LC_{LO} The lowest concentration of a substance (usually in air) that is reported to have caused death in humans or animals.,

LCS0 (Lethal Concentration for 50%) The concentration of a substance in the air which will kill half the test animals exposed within a certain time.

LD50 (Lethal Dose for 50%) A dose of a substance that produces death in 50% of a population of experimental animals. LD_{50}s may be estimated after swallowing, by injection or after application to the skin. It is usually expressed as mg per kg of body weight.

Latency Period The time that elapses between exposure and the first signs of disease.

Leq The equivalent continous sound pressure level. The Leq integrates the sound energy of a fluctuating sound and presents a level which is equivalent to a continuous sound with the same energy content.

Leukemia Cancer of the blood, involving abnormal growth of white blood cells.

Local effects Harmful effects of a chemical at the point of contact or entry to the body.

Local Exhaust Ventilation Engineering controls to capture contaminants at the point of release usually with a specially designed hood.

Lung Function Tests A range of tests to determine the respiratory effectiveness of lungs, in terms of air flow ratio and capacities.

Malignant Signifiying an invasive cancer with an ability to grow at sites other than the tissue of origin as distinct from benign cancer which remains localised within the tissue.

Material Safety Data Sheet A document that describes the properties and uses of a chemical product or formulation - identity, chemical and physical properties; health hazard information; precautions for use; and safe handling information.

Mesothelioma A rare cancer of the lining of the lungs and of the pleural cavity. Almost always related to asbestos exposure.

Metal Fume Fever Flu-like symptoms: commonly experienced after inhalation of welding fumes.

Metabolite A substance produced by the action of the body on an absorbed chemical.

Melting Point A temperature in degrees Celsius at which a substance can exist in solid and liquid form. Normally measured at 760 mm Hg.

mm Hg Millimetre of mercury (Hg). A unit of pressure. See also pascal.

Mist Airborne liquid droplets that are created either by a gas going into the liquid state or by a liquid being splashed, foaming or atomized. Examples: oil mist from cutting, grinding, or from pressure; paint mists from spraying. Using aerosol cans.

Molar (M) Moles per litre. This is a unit of concentration.

Mole Gram molecular weight. This is a unit of mass.

Morbidity The number and type of illnesses suffered by a certain group of people over a particular time. It is usually expressed as a morbidity rate.

Mortality The number and causes of deaths for a particular group of people over a specific time. Often expressed as a mortality rate.

Mucous membrane A membrane lining body cavities connected to the outside. From occupational health aspects the most important mucous membranes are the nose, throat and lung linings.

Mutagens A mutagen is a substance which can cause changes in the *DNA* of cells (mutations). **Mutagenic** means able to cause mutations. **Mutagenicity** is the ability of a substance to cause mutations. *DNA* determines the characteristics that children inherit from their parents. DNA also determines how cells in the body divide or reproduce.

Mutagenesis The process of producing a mutation. See mutation.

Mutation A change in the genetic material of cells.

Narcotic Affecting the central nervous system, especially the brain. Symptoms include giddiness, dizziness, headache, confusion, and in some cases, possibly coma or death. Common effect of organic solvent exposure.

New Technology A general term for the rapid changes in equipment, methods and process in the workplace. New technology often brings unknown new hazards which must be anticipated and dealt with as part of the implementation of change.

NH&MRC National Health and Medical Research Council (Aust.). Used to set voluntary national standards for various occupational hazards. Functions now exercised by NOHSC.

NOHSC National Occupational Health and Safety Commission (Aust) also called Worksafe Australia. Responsible for national co-ordination of health and safety activities and standards. Is a tripartite body with representatives of major employee organisations (ACTU), employer organisations (CAI), and the State/Territory and Commonwealth Governments.

Noise Unwanted sound.

Noise Induced Hearing Loss (NIHL) The slowly progressive inner ear hearing loss that results from exposure to continuous noise over a long period of time as contrasted to trauma or physical injury to the ear.

Occupational Diseases result from repeated or long term exposure to an agent(s) or event(s) or which are the result of a single traumatic event where there was a long latency period (e.g. the development of hepatitis following a single exposure to the infection).

Occupational Hygiene The identification, assessment and control of workplace hazards.

Occupational Injury An employment related injury (damage to the body) as a result of a single traumatic event or the result of a single exposure to an agent(s) causing acute toxic effect. Employment injuries with a long latency period are included in occupational diseases.

Odour Threshold The minimum concentration of the substance in air capable of being detected by the human sense of smell. Normally expressed in parts per million (ppm) or milligrams per cubic metre (mg/m^3).

Oncogenic Capable of producing tumours.

Oral By mouth

Organic Compounds Chemicals containing hydrogen and carbon, along with other atoms. All living things are made of organic compounds.

Overuse Injuries Also called RSI or Occupational Overuse Syndrome. A wide range of distinct conditions affecting muscles and tendons. Associated with rapid repetitive movements of fingers, hands, arms and legs and also with forced static postures.

Oxidising property A property of substances which, although not necessarily combustible, may readily liberate oxygen or be the cause of an oxidation process and which, as a result, may start a fire in other materials or promote the combustion of other materials.

Packaging Group As defined by the ADG code, this means the division of dangerous goods of Classes 3, 4, 5, 6.1, 8 and 9 into three groups according to the degree of danger they present for packaging purposes: "I" (great danger), "II" (medium danger) and "III" (minor danger).

Particulates Solid or liquid particles suspended or dispersed in air. Examples are dusts, mists, fumes, and smoke.

p.p.m. Parts per million. The standard unit of measurement of concentration of contaminants in the environment.

ppm (w/v) in water = mg/L
ppm (w/w) in solids = mg/kg

Pascal SI unit of pressure. See also mm Hg. 101.25 kPa = 1 atmosphere = 760 mm Hg.

Per cent volatiles Percentage of a chemical substance or substances lost by evaporation.

Percutaneous Through or across the skin. Usually refers to absorption of a chemical.

Permit-to-work A document which identifies the plant to be worked on and details of precautions to be taken before work can commence. It predetermines the safe procedure and is a clear record of the hazards that have been anticipated defining the appropriate precautions to avoid them.

Personal Protection Refers to clothing and equipment worn by individual workers when no other means is available to control hazards of work.

pH A unitless value representing how acid or alkaline a solution is. Acids have a pH of less than 7. The lower the pH, the stronger the acid (normal minimum 0). Alkalis have a pH greater than 7. The higher the pH, the stronger the alkali (normal maximum 14).

0.01 M hydrochloric acid has a pH of 2.

0.01 M sodium hydroxide has a pH of 12.

0.01 M acetic acid (a weak acid) has a pH of 3 and 0.1 M ammonium hydroxide (a weak alkali) has a pH of 11. As the pH scale (shown below) is logarithmic, the intervals are exponential, and thus represent far greater differences in concentration than the values seem to indicate.

1	2	3	4	5	6	7	14
strong acids						neutral	strong alkalis

Pure water has a pH of 7. The pH of sea water is 7.8-8.2, pH of gastric juices is 1.7, pH of urine is 5-7, pH of blood is 7.3-7.5 and the pH of milk is 6.5-7.

Photo-Sensitization Where the skin reacts to exposure to light as a result of earlier exposure to particular chemicals or other agents.

Physical Hazards Non chemical agents in the workplace which may post a threat. Heat, Noise, Vibration and Radiation.

Physical State/form Whether a product is in the solid, liquid or gaseous state at room temperature ($20^{\circ}C$).

Poisons Schedule A classification of compounds requiring special labelling and precautions in use. The Poisons Scheduling ultimately applies restrictions at the point of sale. The Standard for Uniform Scheduling of Drugs and Poisons (SUSDP) is recommended by the National Health and Medical Research Council (NH&MRC) and is the basis for State and Territory legislation.

Prohibition Notice A legal written order issued by an Inspector requiring cessation of work until further notice.

Provisional Improvement Notice (P.I.N.) A legal notice which may only be issued by elected Health and Safety Representatives. For use when attempts at negotiation to resolve an issue have failed and there is a breach of the Act or Regulations.

Pulmonary Of the lung.

Radiation: electromagnetic - the transmission of energy via alternating electric and magnetic fields through space or matter e.g. air. Radiowaves, microwaves, infra-red, visible light, ultra-violet radiation and X-rays are examples of electromagnetic radiation.

Radiation: ionizing - radiation that is capable of producing ions i.e. charged particles in the material that they pass through. Ionizing radiation can be electromagnetic e.g. X-rays, gamma rays, or particulate e.g. alpha, beta and neutrons. Capable of causing cancer and genetic defects.

Respirable dust Pieces of solid matter so small that they do not settle out of the air or become trapped by breathing passages. They enter the alveoli of the lungs thus making this type of dust the most hazardous.

Respirator A device which is designed to protect the wearer from inhaling harmful contaminants. May be air purifying non-powered or powered, requiring filters to remove particles or gases or both, or air supplied (e.g. air-line supplied or self contained).

Risk The probability that a potential harm may become actual.

Sensitisation To become sensitive/allergic to the effects of even minute quantities of a substance.

Sensitiser A chemical that causes a substantial proportion of exposed people or animals to develop an allergic reaction in normal tissue after repeated exposure to the chemical.

Shock sensitivity Tendency of a substance to explode if dropped or roughly handled.

SI Number Substance Identification Number. Synonymous with UN Number.

Solubility A measure of how soluble a substance is. Solubility in water is usually expressed as g/l. Other units include g/100cm^3, %, w/v or ppm of water.

Specific gravity is the ratio of the density of a material to the density of water. The density of water is about 1 gram per cubic centimetre (g/cc). Materials which are lighter than water (specific gravity less than 1.0) will float. Most materials have specific gravities exceeding 1.0, which means they are heavier than water and so will sink.

Subsidiary risk A risk in addition to the class to which Dangerous Goods are assigned; and which is determined by a requirement to have a subsidiary risk label under the ADG Code.

Substance A substance is defined as any natural or artificial substance other than an article, whether in solid or liquid form or in the form of a gas or vapour. Other terms used to describe substances include: 'chemicals', 'materials', 'mixtures', 'products', and 'preparations'. Most substances do not contain a single, pure component and many are of complex and variable composition.

SUSDP The Standard for the Uniform Scheduling of Drugs and Poisons. See Poisons schedule.

Synergistic Effects The situation in which the combined effect of two chemicals is much greater than the sum of the effect of each agent alone.

Systemic effects Pertaining to the effects of a chemical on the organs and fluids of the body remote to the point of contact or absorption (as opposed to local effects).

TC_{LO} The lowest concentration of a chemical substance (usually in air) reported to produce any toxic effect in humans or animals.

TD_{LO} The lowest dose of a chemical substance reported to produce any toxic effect in humans or animals.

Teratogen An agent capable of causing abnormalities in the developing foetus, i.e. causing birth defects.

Teratogenesis The causing of abnormalities in a developing foetus, i.e. causing birth defects.

TLV Threshold Limit Value These values are a type of exposure standard promulgated by the American Conference of Governmental and Industrial Hygienists (ACGIH). Three categories of Threshold Limit Value (TLV) exist:

(a) The Threshold Limit Value-Time Weighted Average (TLV-TWA) - the time-weighted average concentration for a normal 8-hour workday and a 40-hour workweek, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.

(b) Threshold Limit Value-Short Term Exposure Limit (TLV-STEL) - the concentration to which workers can be exposed continuously for a short period of time without suffering from:

(i) irritation;
(ii) chronic or irreversible tissue damage; or
(iii) narcosis of sufficient degree to increase the likelihood of accident injury, impair self-rescue or materially reduce work efficiency and provided that the daily TLW-TWA is not exceeded.

It is not a separate independent exposure limit; rather it supplements the time-weighted averate (TWA) limit where there are recognised acute effects from a substance whose toxic effects are primarily of a chronic nature. STELs are recommended only where toxic effects have been reported from high short-term exposures in either humans or animals.

A STEL is defined as a 15-minute time-weighted average exposure which should not be exceeded at any time during a work day even if the eight-hour time-weighted average is within the TLV. Exposures at the STEL should not be longer than 15 minutes and should not be repeated more than four times per day. There should be at least 60 minutes between successive exposures at the STEL. An averaging period other than 15 minutes may be recommended when this is warranted by observed biological effects.

(c) Threshold Limit Value-Ceiling (TLV-C) - the concentration should not be exceeded during any part of the working exposure.

Total Body Burden The amount of a chemical in the body as a result of the introduction by all routes. Many substances accumulate in the body. If the amount of a toxic substance received in the body exceeds the body's ability to excrete the substance, the total body burden may reach a level where bodily harm may occur.

Toxic effect The property of an agent to produce harm or damage to an organism. Usually refers to functional (systemic) damage but may be developmental in respect of tissue and skeleton in the case of the embryo. The damage may be permanent or transient.

Tumour A swelling or enlargement; an abnormal mass of tissue in which the growth of cells is uncontrolled. A tumour can be either benign (not malignant) or malignant (cancerous). A ... called neoplasm.

UN Number A system of four digit numbers assigned by the United National Committee of Experts on the Transport of Dangerous Goods. UN Numbers are assigned to one substance or to a group of substances with similar characteristics. They are not necessarily unique to one chemical, and may cover a group of chemicals with similar hazardous properties (for example epoxy resins).

Vapour The gaseous form of a material which, in its normal state, is a solid or liquid. Vapours occur through the evaporation of a liquid.

Vapour Density Ratio of the density of the vapour compared to the density of air (the density of air is assumed to be one). Vapours with a vapour density greater than 1 will tend to stay close to the floor, whereas vapours with a vapour density less than 1 will tend to rise.

Vapour Pressure When a substance evaporates, its vapours create a pressure, the vapour pressure. This is the pressure at any given temperature in equilibrium with its liquid or solid form. The higher the vapour pressure, the more the substance tends to evaporate.

Ventilation:
General or dilution A system which allows for the continuous removal of contaminated air by replacement with fresh air;
Local Exhaust Ventilation Involves the removal of contaminated air at or near the point of source and is necessary for controlling highly toxic chemical pollutants. This system provides the most effective ventilation because it prevents the contaminants from entering the breathing zone.

Volatile Able to pass readily into the vapour state.

Volatility The tendency of a solid or liquid material to pass into the vapour state at a given temperature in degrees Celsius. Specifically, the vapour pressure of a component divided by its mole fraction (gram molecular weight) in the liquid or solid.

Weight per volume, W/V A measure of content of a solid in a solution.

Weight per weight, W/W A measure of content of a solid in a solid.

Adapted from: Guidance Note for Completion of a Material Safety Data Sheet, Worksafe Australia, 2nd Edition 1990 and Glossary of Health and Safety Terms, Occupational Health and Safety Manual - ADSTE, Victoria.

APPENDIX 4

Appendix 4 provides worked examples of priority ratings for occupational health and safety topics and a master worksheet. These are examples only, and curriculum developers will need to devise their own ratings for each trade area. Curriculum developers should use the worksheets to indicate the relevance and emphasis a specific topic should receive.

Once the relevance has been established this can be indicated using the priority table below.

Table 1: Priority Table

STATUS	PRIORITY
Very Important: should be emphasised	1
Quite Important: requires moderate coverage	2
Some Importance: should be mentioned	3
No Relevance	0

APPENDIX 4: CURRICULUM DEVELOPMENT WORKSHEETS - EXAMPLES OF THE PRIORITY RATINGS FOR OCCUPATIONAL HEALTH AND SAFETY ISSUES

COURSE/VOCATION .... METAL FABRICATION

CURRICULUM TOPICS		PRIORITY RATING			
Code	TOPIC NAME	1	2	3	0
	CORE MODULE	X			
	NON CORE MODULE: Chemical Hazards	X			
	Noise	X			
	Vibration		X		
	Heat and Cold	X			
	Overuse Injuries			X	
	Manual Handling	X			
	Lighting			X	
	Radiation		X		
	Safe Working in Confined Spaces	X			
	Electrical	X			
	Biological Agents			X	
	The Home as a Work Area			X	
	Vehicle and Road Safety			X	
	Personal Protective Equipment		X		
	Occupational First Aid	X			

APPENDIX 4: CURRICULUM DEVELOPMENT WORKSHEETS - EXAMPLES OF THE PRIORITY RATINGS FOR OCCUPATIONAL HEALTH AND SAFETY ISSUES

COURSE/VOCATION .... BRICKLAYING

CURRICULUM TOPICS		PRIORITY RATING			
Code	TOPIC NAME	1	2	3	0
	CORE MODULE	X			
	NON CORE MODULE: Chemical Hazards	X			
	Noise		X		
	Vibration		X		
	Heat and Cold	X			
	Overuse Injuries	X			
	Manual Handling	X			
	Lighting			X	
	Radiation			X	
	Safe Working in Confined Spaces				X
	Electrical		X		
	Biological Agents			X	
	The Home as a Work Area			X	
	Vehicle and Road Safety			X	
	Personal Protective Equipment		X		
	Occupational First Aid	X			

APPENDIX 4: CURRICULUM DEVELOPMENT WORKSHEETS - EXAMPLES OF THE PRIORITY RATINGS FOR OCCUPATIONAL HEALTH AND SAFETY ISSUES

COURSE/VOCATION .... HORTICULTURE

CURRICULUM TOPICS		PRIORITY RATING			
Code	TOPIC NAME	1	2	3	0
	CORE MODULE	X			
	NON CORE MODULE: Chemical Hazards	X			
	Noise	X			
	Vibration	X			
	Heat and Cold,	X			
	Overuse Injuries			X	
	Manual Handling	X			
	Lighting			X	
	Radiation			X	
	Safe Working in Confined Spaces			X	
	Electrical		X		
	Biological Agents	X			
	The Home as a Work Area			C	
	Vehicle and Road Safety			X	
	Personal Protective Equipment		X		
	Occupational First Aid	X			

APPENDIX 4: MASTER SHEET FOR CURRICULUM DEVELOPMENT WORKSHEETS

COURSE/VOCATION ...

CURRICULUM TOPICS		PRIORITY RATING				NOTES
Code	TOPIC NAME	1	2	3	0	
	CORE MODULE					
	NON CORE MODULE: Chemical Hazards					
	Noise					
	Vibration					
	Heat and Cold					
	Overuse Injuries					
	Manual Handling					
	Lighting					
	Radiation					
	Safe Working in Confined Spaces					
	Electrical					
	Biological Agents					
	The Home as a Work Area					
	Vehicle and Road Safety					
	Personal Protective Equipment					
	Occupational First Aid					

APPENDIX 5: ORGANISATIONS THAT CAN HELP

1. ACTU-VTHC Occupational Health and Safety Unit,
   Trades Hall,
   P.O. Box 93,
   CARLTON SOUTH VIC 3053

2. ACTU National Occupational Health & Safety Unit,
   ACTU,
   393 Swanston Street,
   MELBOURNE VIC 3000

3. Commonwealth Department of Health,
   P.O. Box 100,
   WODEN ACT 2606

4. Commonwealth Scientific and Industrial Research Organisation (CSIRO),
   314 Albert Street,
   EAST MELBOURNE VIC 3002
   03 418 7333

5. Confederation of Australian Industry,
   44th Level,
   Nauru House,
   80 Collins Street,
   MELBOURNE VIC 3000

6. Department of Health, NSW,
   Joseph Street,
   LIDCOMBE N.S.W. 2141

7. Department of Health, QLD,
   6th Floor,
   Health and Welfare Building,
   63-79 George Street,
   BRISBANE QLD 4000

8. Department of Industrial Affairs, QLD,
   20th Floor,
   State Law Building,
   George and Ann Streets,
   BRISBANE QLD 4001

9. Department of Industrial Relations, NSW,
   1 Oxford Street,
   DARLINGHURST N.S.W. 2010

10. Department of Labour and Industry, TAS,
    81-89 Brisbane Street,
    HOBART TAS 7000

11. Department of Occupational Health, Safety & Welfare, WA,
Willmar House,
600 Murray Street,
WEST PERTH W.A. 6005

12. National Acoustic Laboratories,
Commonwealth Department of Health,
126 Greville Street,
CHATSWOOD N.S.W. 2067

13. National Health & Medical Research Council (NH&MRC),
P.O. Box 100,
WODEN ACT 2606

14. National Occupational Health and Safety Commission,
(Worksafe Australia),
Level 30,
St. Martins Tower,
York Street,
SYDNEY N.S.W. 2000

15. National Safety Council of Australia,
Federal Secretariat,
Industry House,
370 St. Kilda Road,
MELBOURNE VIC 3004

16. Safety Institute of Australia,
Federal Secretary,
P.O. Box 163,
BLACKBURN VIC 3130

17. South Australia Department of Labour,
SGIC Building,
211 Victoria Square,
ADELAIDE S.A. 5001

18. South Australia Health Commission,
52 Pirie Street,
ADELAIDE S.A. 5000

19. Standards Australia,
Standards House,
80-86 Arthur Street,
NORTH SYDNEY N.S.W. 2060

20. TAFE National Centre for Research and Development,
296 Payneham Road,
ADELAIDE S.A. 5070

21. Victorian Institute of Occupational Safety and Health,
Ballarat College of Advanced Education,
P.O. Box 663,
BALLARAT VIC 3350

22. Victorian Occupational Health and Safety Commission,
Nauru House,
80 Collins Street,
MELBOURNE VIC 3000

INTERNATIONAL ORGANISATIONS

1. Swedish Work Environment Fund,
Box 1122, S-111 81,
STOCKHOLM SWEDEN

2. Accident Compensation Corporation,
Private Bag,
WELLINGTON NEW ZEALAND

3. New Zealand Department of Labour,
Private Bag,
WELLINGTON NEW ZEALAND

4. New Zealand Department of Health,
P.O. Box 5013,
WELLINGTON NEW ZEALAND

5. Canadian Centre for Occupational Health & Safety,
250 Main Street East,
Hamilton,
Ontario L8N 1H6,
CANADA

6. International Labour Organisation,
GENEVA SWITZERLAND

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South Australia:	55 Currie St., Adelaide 5000	08 237 6955
ACT:	70 Alinga St., Canberra 2600	062 477 211

APPENDIX 6: SOURCES OF INFORMATION

Jackson, Helen, 1986, *Carson's Occupational Health and Safety in Australia - A guide to sources of information*, Techpress, P.O. Box 158, Stepney, S.A., 5069.

Department of Employment and Industrial Relations Working Environment Branch, 1983, *Sources of Information at Work*, AGPS. (A resource particularly for the Australian Standards pertaining to particular occupations and hazards - needs revising).

Worksafe Australia, 1988, *Occupational Health and Safety Organisations in Australia*, AGPS, Canberra, Australia.